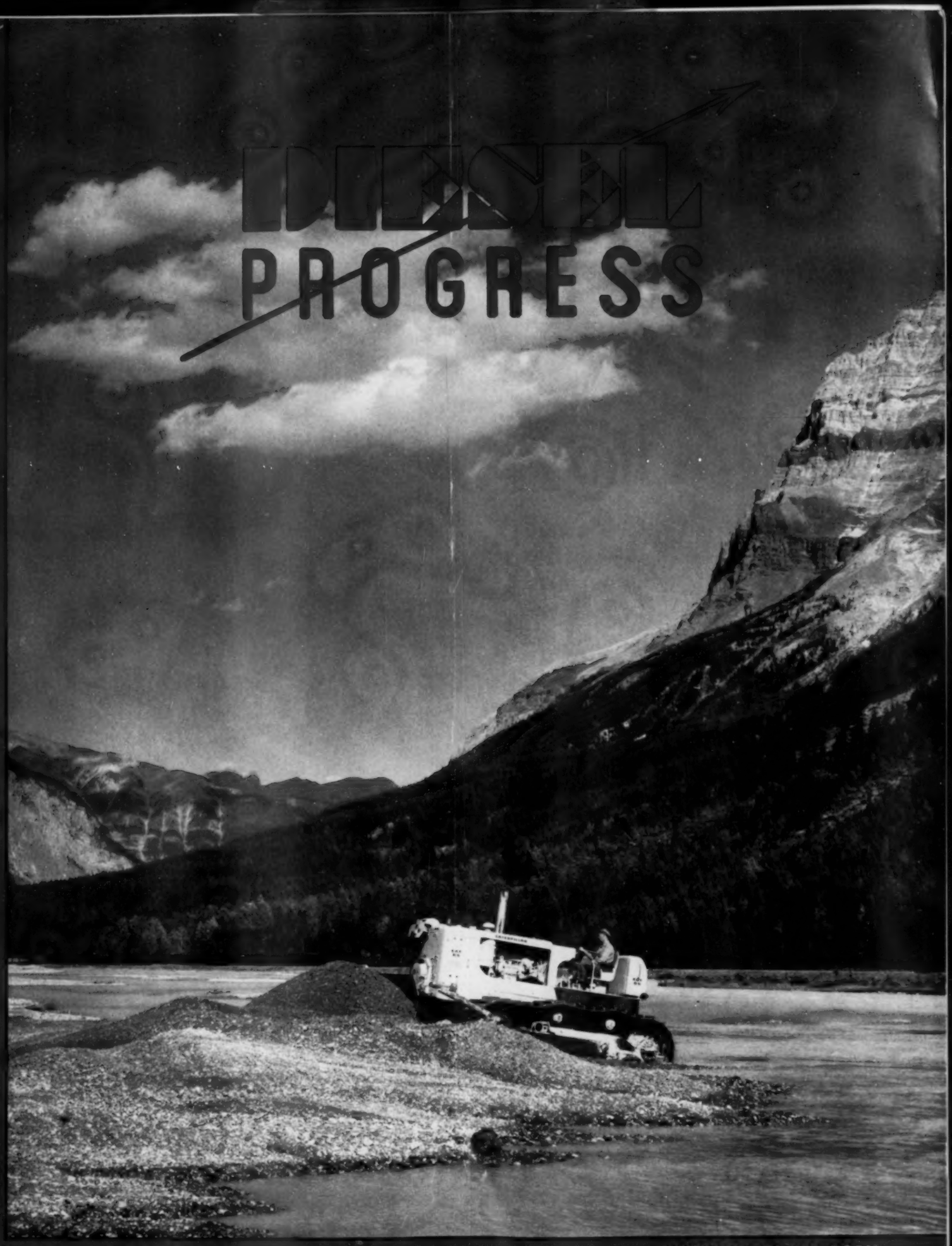
DIESEL PROGRESS

IN INDUSTRY • IN TRANSPORTATION • ON THE SEA • IN THE AIR



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NOVEMBER, 1957

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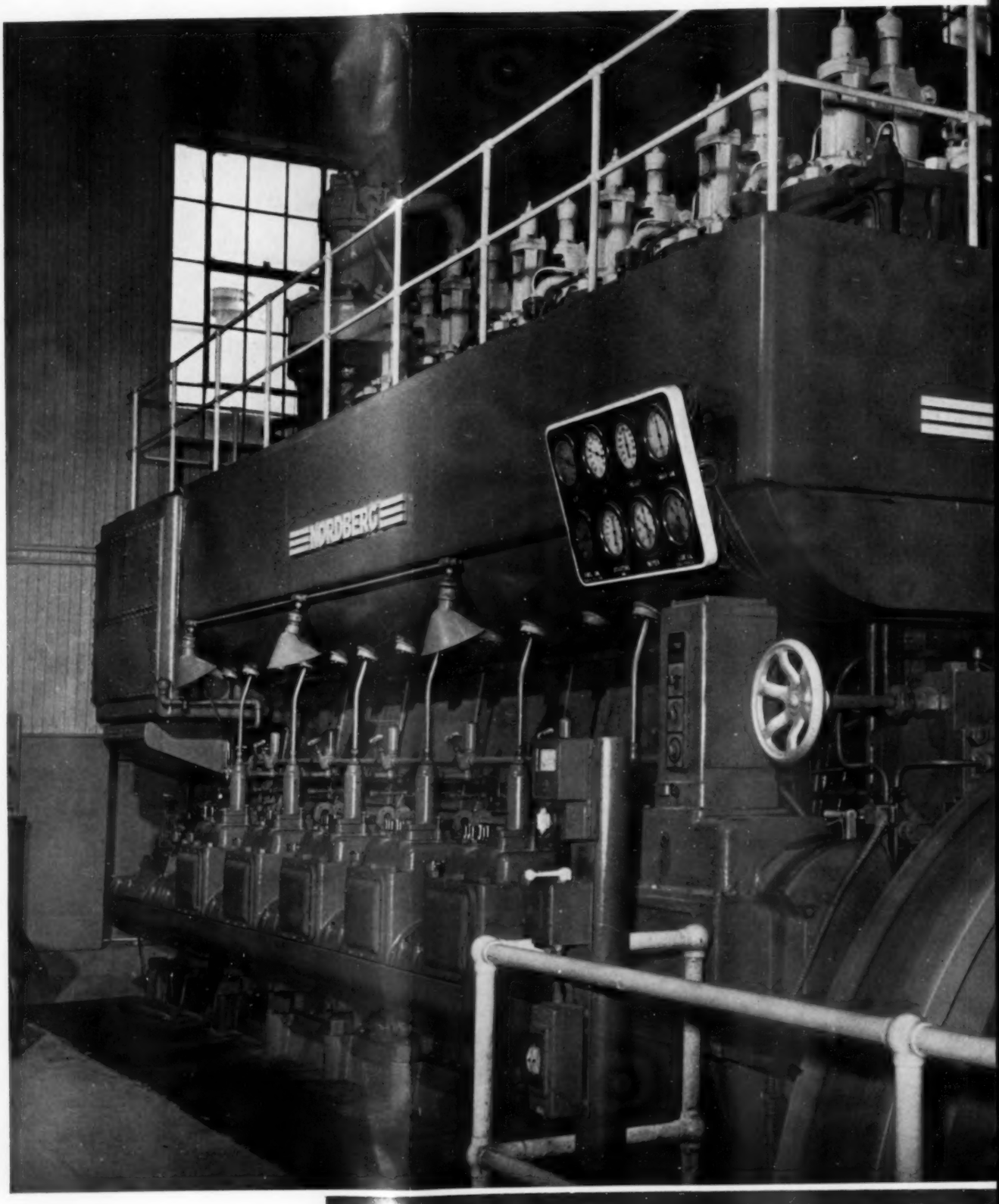

TEXACO

Make sure you get the power you pay for

When fuel and maintenance bills get out of hand and power's not up to par, chances are your oil is the culprit. Let your Texaco Lubrication Engineer recommend the proper grade of *Texaco Ursa Oil.*

Texaco Ursa Oils keep diesel systems running clean for full compression and complete combustion . . . prevent harmful deposits in the combustion chamber, in crankcase and on valves. They help minimize ring, cylinder and bearing wear—all of which adds up to full power on less fuel and lower maintenance costs.

For over twenty years more stationary diesel horsepower in the United States has been lubricated with Texaco than with any other brand.

There is a complete line of *Texaco Ursa Oils* to meet the requirements of all diesel, gas and dual-fuel engines.

Just call the nearest of more than 2,000 Texaco Distributing Plants in the 48 States—or write The Texas Company, 135 East 42nd Streeet, New York 17, N. Y.

URSA OILS FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES

HARRISON CAPS THE HEAT!

Harrison-cooled GM Twin Diesel stays on the job 6½ years with no down time

Harrison provides endurance with assurance! This GM Twin Diesel drilled for oil on a 24-hour-a-day schedule for more than six years with no down time. And Harrison handled the heat every minute! This is typical of the rugged, trouble-free performance you can expect from Harrison heat exchangers. Harrison's 47 years' experience in the manufacture of heat-control products is your assurance of a top-quality product. If you have a cooling problem, look to Harrison for the answer.

HARRISON HEAT EXCHANGERS

Temperatures made to order for all types of diesel engines. Harrison heat exchangers are rugged, reliable and compact . . . engineered to provide the optimum in cooling efficiency.

HARRISON

GM FORWARD FROM EIGHTY

HARRISON RADIATOR DIVISION • GENERAL MOTORS CORPORATION • LOCKPORT, N.Y.

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EDITORIAL AND PRODUCTION OFFICES

816 N. La Cienega Blvd. Los Angeles 46, Calif.

BUSINESS OFFICES

MILWAUKEE 3:
Bruce W. Wadman
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Division 4-5355

NEW YORK 36:
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O. F. Cozier
605 Mayo Bldg.
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FIELD EDITORS

HIALEAH, FLA.:
Edwin Dennis
250 W. 50th St.
TUxedo 8-2188

LOS ANGELES 46:
James Joseph
8421 Melrose Ave.
OLive 3-4542

HOUSTON, TEXAS:
Michael T. Pate
1948 Lexington
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TULSA 3:
Jack F. Cozier
305 Daniel Bldg.
Diamond 3-1335

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L. H. Houck
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FRONT COVER ILLUSTRATION

This Caterpillar diesel D9 tractor equipped with 9A Bulldozer is building a dike in the river to keep water out of borrow pit. River run gravel is used for fill on section of Trans-Canada Highway, under construction, near Field, B.C., Canada.

UNITIZED POWER
FOR EVERY INDUSTRY
6-110 Industrial Quad
1000 HP
75 KW Generator Set
PARTS • SERVICE
STEWART & STEVENSON SERVICES
ANYTIME • ANYWHERE
Portable Pumping Units
Whatever your power needs, whatever the application, Stewart & Stevenson can help you if you have a power problem.
COMPLETE FACILITIES ALL UNDER ONE ROOF:
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All units can be furnished with either diesel engines or gas, gasoline or butane engines.
STEWART & STEVENSON SERVICES, Inc.
4516 HARRISBURG BLVD. • HOUSTON, TEXAS • PHONE CApitol 5-5341
75 KW Mobile Diesel Electric Power Plant
Combination Oil Field Rig Lighting, Welding and Auxiliary Unit
THE WORLD'S LARGEST DISTRIBUTOR OF GM DIESEL ENGINES

ONLY THE WESTINGHOUSE POWER SHIFT TRANSMISSION GIVES YOU ALL 3

1 4 SPEEDS FORWARD, 4 REVERSE

2 COMPACT, INTEGRAL DESIGN

3 500 FT-LBS TORQUE CAPACITY

The new power shift transmission by Westinghouse is designed for use on engine-driven equipment used off the highway where multi-speed operation is required.

Consisting of a torque converter and a power transmission compactly designed in an integral housing, the Westinghouse power shift transmission combines in one package the desirable features of the hydraulic torque converter, fluid coupling and power shift transmission. The entire unit is less bulky, takes less space . . . can be less expensively installed and maintained.

With four speeds forward and reverse, the Westinghouse power shift transmission is ideally suited for vehicles which must travel in both directions during a normal work cycle. Using the simple, rugged counter-shaft principle with constant-mesh gears, field maintenance is reduced to a minimum. The transmission has two ranges, with each range having two speeds, both forward and reverse. (A high range for high vehicle speeds at moderate loads and a low range for low vehicle speeds at heavy loads.)

Simple to operate, a flip of the operator's lever accomplishes power shifts within each range, including forward and reverse . . . and without any interruption of power flow through the transmission and drive.

Automatic feature of the converter and ease of power shifting simplifies operator training and substantially contributes to longer operating life of the equipment. Absence of clutch pedal assures smooth, maximum traction acceleration.

Rated at 500 ft-lbs maximum input torque, the Westinghouse power shift transmission can be used with a wide range of internal combustion engines . . . including the Continental PE-200-1; Cummins HRBB-600, JT-6, JBS-600; General Motors 4-71, 3-71; Hall-Scott 590; Waukesha 140-GZB, 145-GKB, and many others.

J-07363 A

CHECK THESE SPECIFICATIONS:

GEAR RATIOS	
LOW RANGE	**FORWARD AND REVERSE**
1st gear	6.85
2nd gear	3.43
HIGH RANGE	
3rd gear	2.14
4th gear	1.07

OPTIONAL EQUIPMENT: Direct connection to engine flywheel; convertor tail shaft governor drive; speedometer drive; parking brake.

FOR MORE INFORMATION

fill in coupon and drop it in the mail today. Your free copy of the new, timely WESTINGHOUSE TRANSMISSION DESIGN REPORT will be rushed to you immediately.

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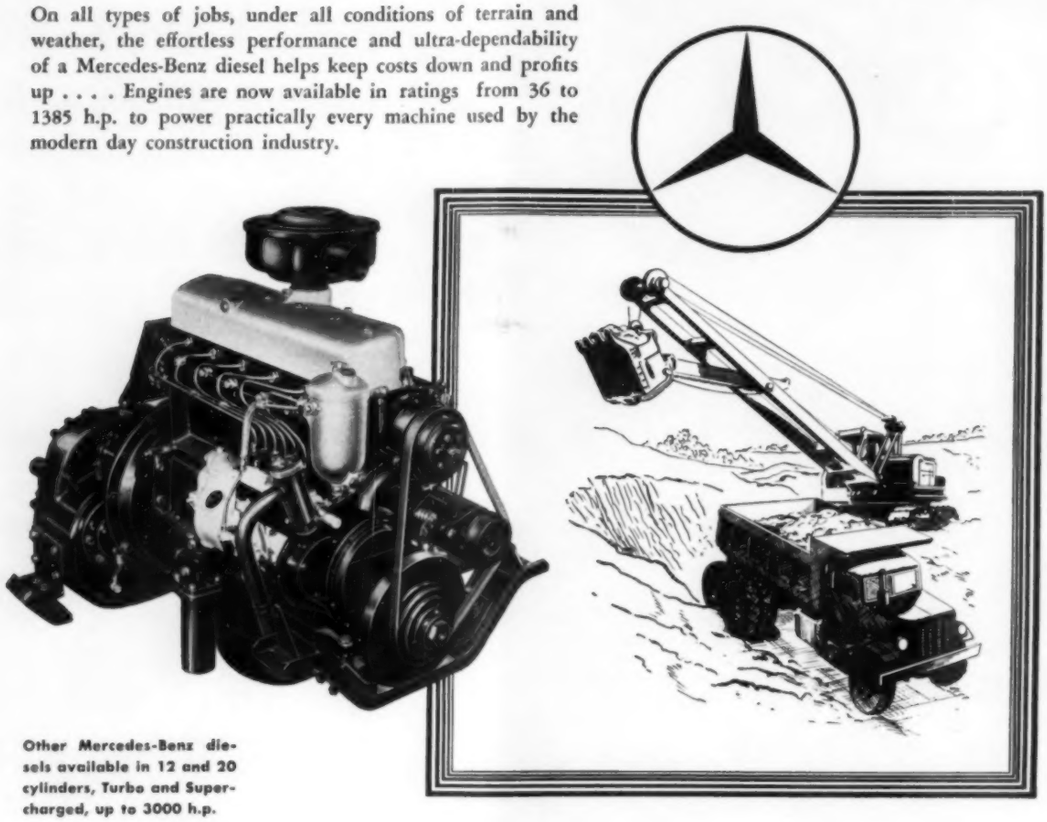
YOU CAN BE **SURE**...IF IT'S

Westinghouse

MERCEDES-BENZ
DIESEL ENGINES
Now Available to Power Equipment in the CONSTRUCTION INDUSTRY

On all types of jobs, under all conditions of terrain and weather, the effortless performance and ultra-dependability of a Mercedes-Benz diesel helps keep costs down and profits up . . . . Engines are now available in ratings from 36 to 1385 h.p. to power practically every machine used by the modern day construction industry.

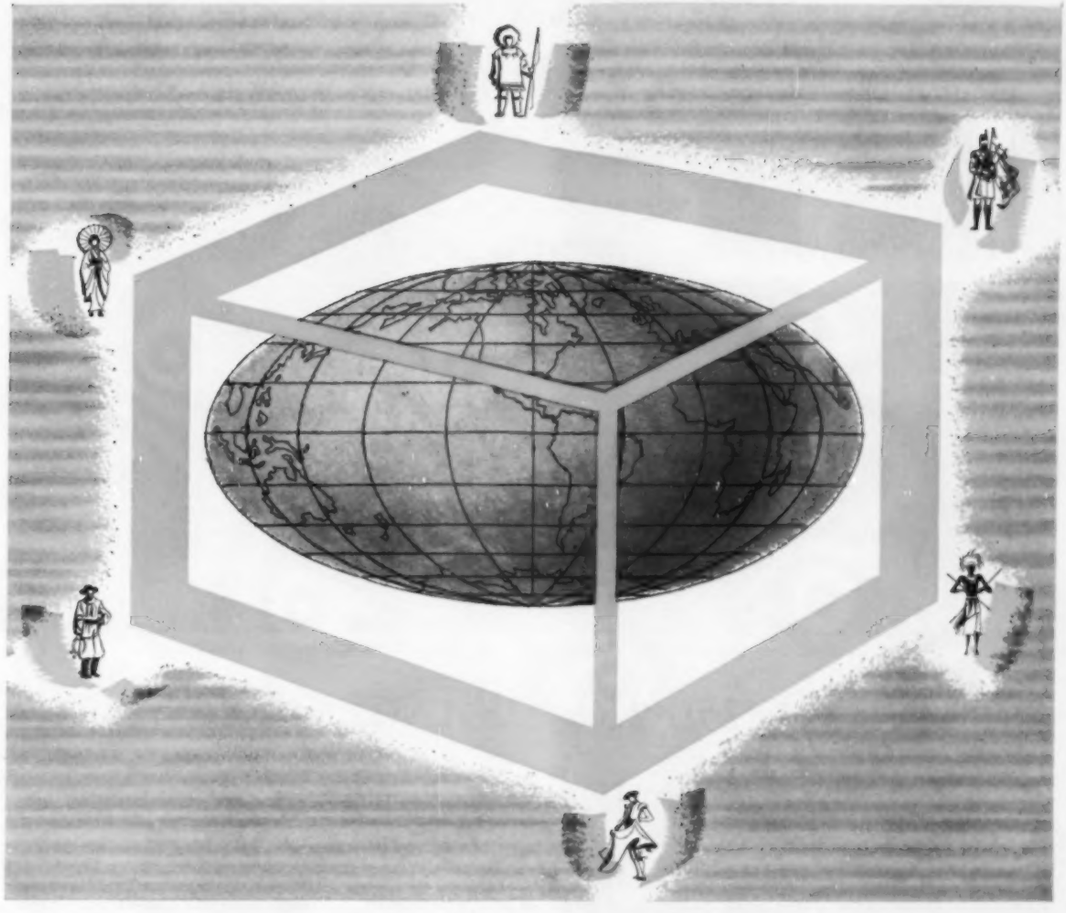


Other Mercedes-Benz diesels available in 12 and 20 cylinders, Turbo and Supercharged, up to 3000 h.p.

All Mercedes-Benz diesel engines are 4-stroke and work on the time-proven, pre-chamber combustion process, assuring greatest possible quietness and smokeless combustion even under changing loads and different fuel qualities . . . Mercedes-Benz diesels are liquid cooled and equipped with an automatic control guaranteeing complete operating safety, even under extreme climatic conditions . . . Other plus features include their easy handling, simple maintenance, economical fuel consumption and the small space required for installation . . . Unusually long life is a proven fact with Mercedes-Benz!

Several attractive territories are available to qualified distributors

UTICA-BEND DIVISION
CURTISS-WRIGHT
CORPORATION • UTICA, MICHIGAN



In the far corners of the globe...

The performance and the brand are the same around the world

Other outstanding Shell Industrial Lubricants

Shell Tellus Oil—for closed hydraulic systems

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Shell Turbo Oils—for utility, industrial & marine turbines

Shell Dromus Oil—cutting oils for high-production metalworking

Shell Talona R Oil 40—anti-wear crankcase oil for diesel locomotives

Shell Rimula Oil is a heavy-duty oil designed to solve the toughest lubricating problems in diesel engines.

Rimula® Oil reduces cylinder and bearing wear caused by acidic combustion products that are increased by low jacket temperatures. It remains stable under the widest temperature extremes encountered in modern operation. It keeps engine parts clean and operating efficiently over longer periods...effecting worth-while savings in labor and parts.

Rimula Oil, regarded in the U.S.A. by manufacturers and operators as an indispensable accessory to heavy-duty vehicular operation, is available to your customers abroad under the same brand. For full information, write: Shell Oil Company, 50 West 50th St., New York 20, N. Y., or 100 Bush St., San Francisco 6, Calif.

SHELL RIMULA OIL

SHELL

The new Wooldridge "Cobrahaul" Rear Dump Unit with Fuller 9-speed R-1150 ROADRANGER Transmission.

FULLER R-1150 ROADRANGER® Transmission standard on new Wooldridge "Cobras"!

The Fuller 9-speed R-1150 ROADRANGER Transmission is *standard equipment* in the new Wooldridge 35-ton, 275 hp diesel "Cobrahaul" Dumper and 26-yard 300 hp diesel "Cobra Quad" Scraper. Haul speeds exceed 32 miles an hour on the big 63,400 lb. unit.

Throughout the complete Wooldridge line . . . from the giant 41-yard scrapers down to and including the 7.5-to-10-yard "Cobrette," Fuller Transmissions are standard on Wooldridge Scrapers and hauling units.

Why? Only the most rugged, dependable transmissions can take the terrific shock loads—sudden starts—stops—torque reversals found in all kinds of off-highway operations from solid rock hauling to soggy swamp jobs.

Fuller Transmissions provide maximum ease of shifting ratios for faster acceleration and long life required for these operating conditions.

In Wooldridge's "Cobrahaul" and "Cobra Quad," the Fuller R-1150 ROADRANGER Transmission offers these additional advantages:

- **No gear splitting—9 selective gear ratios evenly and progressively spaced**
- **Easier, quicker shifts—38% steps between ratios**
- **One shift lever controls 9 forward and 1 reverse speeds**
- **Engines work in peak hp range with greater fuel economy**
- **Less driver fatigue—⅓ less shifting**
- **Range shifts pre-selected—automatic and synchronized**

From over 110 models available for rubber-tired equipment, there's a Fuller Transmission designed to do your job.

really where horsepower goes to work

Fuller TRANSMISSIONS

FULLER MANUFACTURING COMPANY (Transmission Division), KALAMAZOO, MICHIGAN

Unit Drop Forge Div., Milwaukee 1, Wis. • Shuler Axle Co., Louisville, Ky. (Subsidiary) • Sales & Service, All Products, West. Dist. Branch, Oakland 6, Cal. and Southwest Dist. Office, Tulsa 3, Okla.

The Engineer's Field Report

CASE HISTORY

PRODUCT Chevron Starting Fluid

FIRM Great Northern Railway Havre, Montana

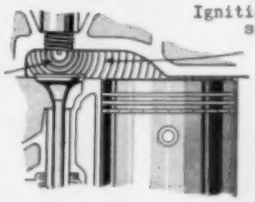
Special fluid starts 250-ton crane instantly, saves time in emergencies—even at 50° below

GREAT NORTHERN RAILWAY'S 250-TON, RAILROAD CRANE (above) starts instantly with Chevron Starting Fluid in temperatures ranging to 50° below zero—even after standing idle for months at a time. Former steam-powered wrecker equipment took crew 12 hours to start. This crane with its two 174 h.p. Cummins diesel engines is now available for derailment emergencies on short notice.

"Slow-grind starts on battery power alone waste too much valuable time. Chevron Starting Fluid fires these engines 'right now'—in any weather." A Great Northern engineer shows how simple it is to insert 7CC gelatin capsule of Chevron Starting Fluid in unit's air-intake system. Fluid is also available in 17CC capsules and 1-pint cans.

Why Chevron Starting Fluid starts engines instantly

Highly volatile: 7 times more than gasoline



Ignition temperature several hundred degrees lower than diesel fuel

Contains wear-reducing lubricants

Additives inhibit ice formation

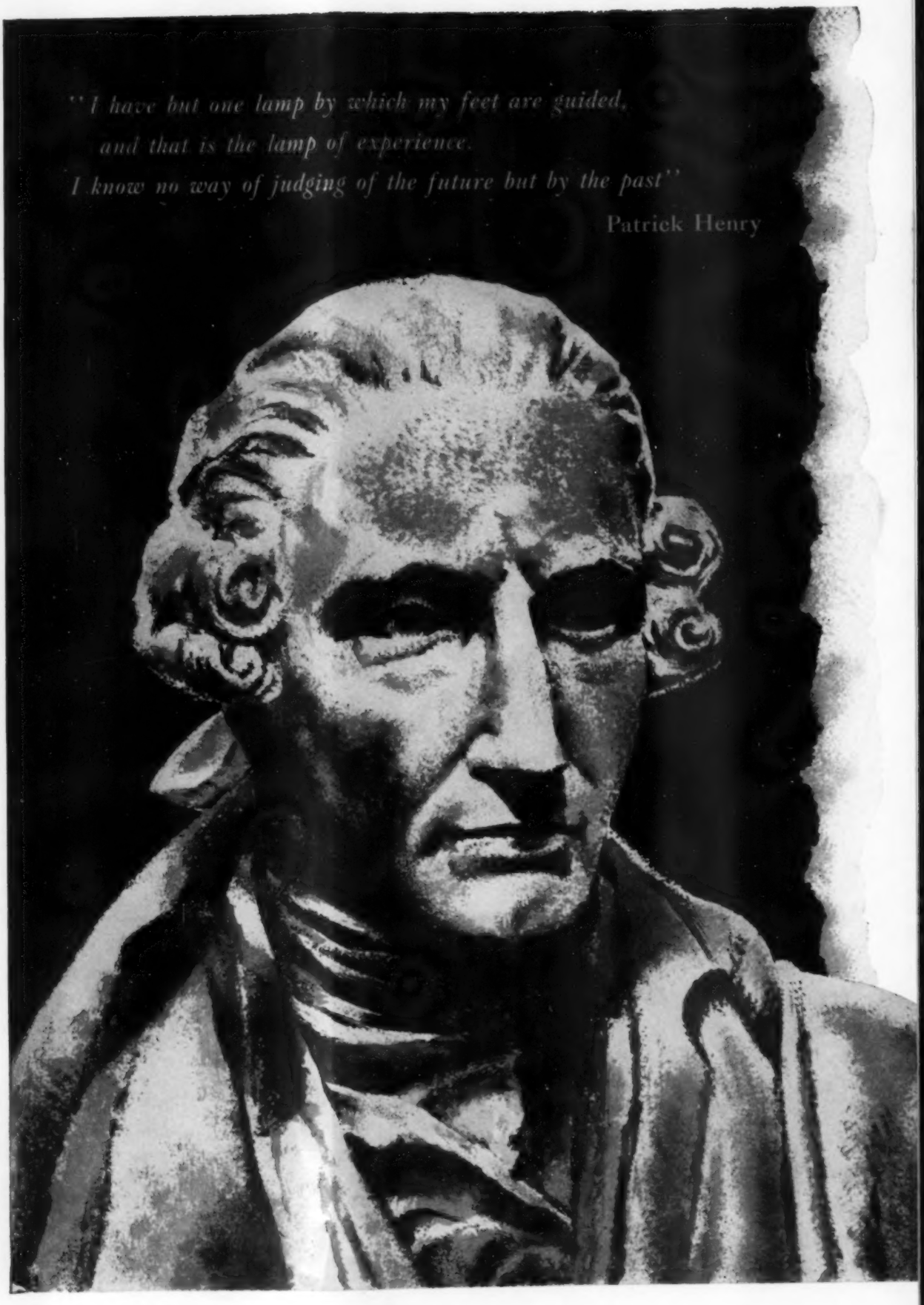
CHEVRON STARTING FLUID

FREE FOLDERS tell more about the Chevron Starting Fluid and Chevron Pressure Primer System. Write or ask for them.

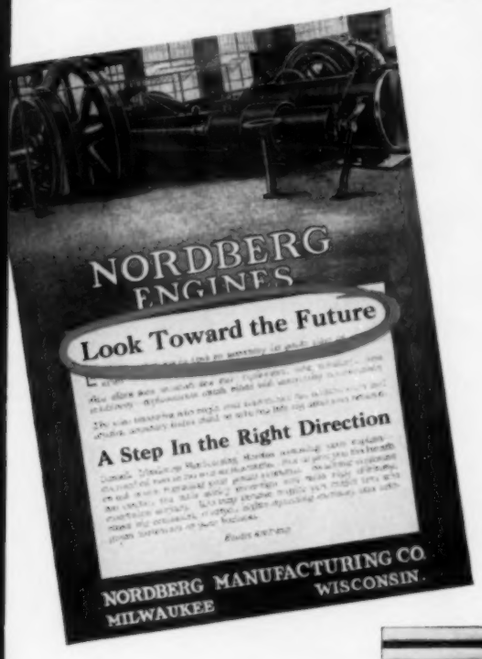
FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor, write or call any of the companies listed below.

TRADEMARK "CHEVRON" AND DESIGN REG. U. S. PAT. OFF.

STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20 • STANDARD OIL COMPANY OF TEXAS, El Paso
THE CALIFORNIA OIL COMPANY, Perth Amboy, New Jersey • THE CALIFORNIA COMPANY, Denver 1, Colorado


"I have but one lamp by which my feet are guided,
and that is the lamp of experience.
I know no way of judging of the future but by the past"
Patrick Henry

Look Toward the Future



NORDBERG continues to anticipate and meet the power needs of industry

True today as it was in the early 1900's when the advertisement at the left was published, Nordberg continually looks toward the future needs of the power industry. This philosophy characterizes Nordberg . . . a leader in the progress made in internal combustion engines. With *experience* as our guide Nordberg continues to pioneer . . . to design and build highly efficient prime movers . . . prime movers that will economically and reliably provide the power required in the decades of tremendous growth ahead.

NORDBERG MFG. CO., MILWAUKEE, WISCONSIN

Builders of America's Largest Line of Heavy Duty Engines

NORDBERG

DIESEL • DUAFUEL® AND SPARK IGNITION GAS ENGINES

© 1957, Nordberg Mfg. Co P1057

The world's largest internal combustion engine power station—220 Nordberg spark-ignition gas burning Radial engines generate all power for electrolytic reduction of aluminum at the Aluminum Company of America's Point Comfort, Texas smelting works. 22 more Radial engines soon to be installed will provide nearly 475,000 total horsepower. This installation is an excellent example of Nordberg's ability to meet specific power requirements.

6 *reasons why STANODIESEL Oil M can help you get better diesel engine performance*

Stability. Only selected distilled lubricating stocks from Mid-Continent crudes are used to make STANODIESEL Oil M. Base stocks are then solvent-extracted to remove unstable components. Oil is further stabilized by an oxidation inhibitor. The oxidation inhibitor used also acts as a metal deactivator, forming a barrier against corrosion. As a result of these advanced refining techniques, STANODIESEL Oil M resists the formation of varnish, sludge, acid bodies and carbon-like deposits. Viscosity increase, a problem in many types of service, is likewise controlled.

Detergent-Dispersant Qualities. Additives keep engines clean and disperse contaminants by holding them suspended in harmless form.

High Viscosity Index. STANODIESEL Oil M's high V. I. means easier cold starts, better sealing of rings and lower oil consumption at running temperatures.

Nonfoaming. Antifoamer additive eliminates foaming. STANODIESEL Oil M may be used in hydraulic governors.

Low Pour Point. STANODIESEL Oil M is propane-dewaxed to remove undesirable constituents and permit flow at low temperature.

Less Engine Maintenance. STANODIESEL Oil M helps give these low maintenance benefits: reduced port deposits, fewer stuck rings, less cylinder wear, fewer bearing problems.

STANDARD

STANDARD OIL COMPANY
(Indiana)

Get all the facts about STANODIESEL Oil M from your local Standard Oil industrial lubrication specialist anywhere in the 15 Midwest and Rocky Mountain states. Or write Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

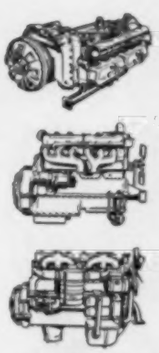
WORLD-RENOWNED FOR RUGGED SERVICE

CD.650 VERTICAL
6 cylinders. 5" bore. 5½" stroke. Capacity 10·6 litres (648 cubic ins.) Maximum power 150 BHP. at 2000 RPM.

DAIMLER DIESELS

Now available for AMERICA

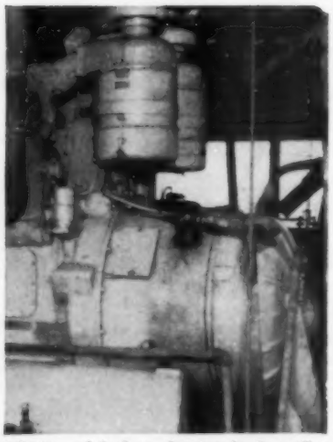
From Daimler, pioneer of Britain's automotive industry comes this fine range of rugged six cylinder Diesel engines. For trucks, buses, tractors, boats, there is a Daimler Diesel to suit many applications. Four types, from 125 to 170 horsepower in vertical and horizontal layouts. All built to the superlative standards associated with the Daimler name and all backed by years of service in the hands of operators throughout the world.



Daimler
ENGLAND

We invite U.S. Distributors interested in handling the Daimler Diesel range to write today for further detailed information to . . .

THE DAIMLER CO. LTD., ENGINES DIVISION, COVENTRY, ENGLAND



Left: View of the barge housing the Caterpillar D386 Diesel Engine equipped with a Twin Disc 16,000 Series Torque Converter. *Above:* Close-up of the Twin Disc Torque Converter.

Ray Harless, Secretary, and D. L. Harless, Woods Foreman, Harless Lumber Co.

"Our engine-torque converter package almost paid for itself the first year,"

says Ray Harless, Harless Lumber Co.

For really rugged logging, it's hard to beat Harless Lumber Co., Lake Charles, Louisiana, which logs cypress out of Louisiana's southwestern swamplands, in areas a foot or so below sea level. Its operations consist of snaking logs to dredged areas where they can be towed to the mill. The average load is about 3000 bft, and snaking distances sometimes run up to a mile.

To streamline operations, the firm replaced its logging barge's steam equipment with a Cat D386 Diesel Engine equipped with a Twin Disc Three-Stage Torque Converter. A year later, Company Secretary Ray Harless had this to say: "During the first 12 months we effected a saving in operating cost, over the steam rig, almost sufficient to pay for the complete engine-torque converter unit."

Not only were operating costs reduced significantly, but the new power unit offers more than ample torque output—thanks to the Twin Disc Torque Converter. Regardless of the size load being snaked, the torque converter matches engine input torque exactly as required.

It offers additional advantages too. It's easier on drive components and cables, because the "fluid" drive characteristics are always smooth, without sudden shock loads and vibrations normally associated with load pick-up. Another advantage is that the torque converter permits the engine to operate in its rated speed range, permitting full output hp whenever required.

Results in this application are typical of what loggers everywhere have found by using Twin Disc Torque Converters . . . in winches and hoists . . . in loaders and yarders . . . in tractors and trucks. Invariably Twin Disc Torque Converters improve performance, cut costs and get more work done on a comparative basis.

Twin Disc Clutch Company, Racine, Wisconsin; Hydraulic Division, Rockford, Illinois.

TWIN DISC

TWIN DISC

Torque Converters

"Negligible wear" result of proper filter maintenance by Captain F. E. Lister of *FRAM II*

Engines in practically perfect condition after 3,000 hours!

Proof of the efficiency from FRAM Oil and Fuel Oil Filters and Water Separators is found in the story of the *FRAM II!* This four year old 65-footer is in almost constant service off New England and along the Florida coast.

Berthed for precautionary overhaul, tachometers showed over 3,000 hours of operation without breakdown or trouble of any kind. Total dismantling of the engines by manufacturer's service people resulted in this report:

> **"Pistons, liners, rings, piston pins, piston pin bushings, connecting rod bearings and main bearings showed very little wear."**

That's the kind of report every boat owner wants to hear. It means years of trouble-free pleasure. And it's so simple to obtain! Just follow the advice of Captain Lister, skipper of the *FRAM II:* change FRAM Lube Oil Filters every 125 hours; fuel oil filters twice a year; water separator filter at least once a year!

FRAM Corp., Providence 16, R.I. • Fram Canada Ltd., Stratford, Ont.

Guardians of Engine Life

Lube Oil Filter keeps lube oil clean, free from abrasives. Regular cartridge changes resulted in only 3 lube oil changes in three years!

FRAM Fuel Filter and Water Separator prevents fouling and clogging of fuel injectors; prevents nozzle etching; keeps your engine throbbing along without a sign of trouble!

On land, sea or in the air... FRAM filters best!

3 dependable products for the diesel industry

DE LAVAL IMO PUMPS

De Laval IMO pumps do a dependable job during long years of service. The reason is IMO design simplicity. De Laval IMO's have only three moving parts—smoothly intermeshing rotors that propel the fluid axially in a steady flow without churning, pocketing or pulsation. There are no reciprocating parts to wear or become noisy. Quiet, compact IMO pumps are excellent for direct-connected, high-speed operation. They can be furnished in capacities to 1,000 gpm and pressures to 1,500 psig.

DE LAVAL HYDRAULIC FAN DRIVES

De Laval Hydraulic Fan Drives for air cooled heat exchangers and cooling towers offer these important advantages. They *save* power since the fan operates at full speed only a portion of the time. They provide *accurate, automatic* control of engine jacket water temperature, and also assure complete operational flexibility. These units stay on the job for years. As shown, both IMO motor and speed reducer are mounted and factory aligned on a single bedplate.

DE LAVAL HIGH PRESSURE TURBOCHARGERS

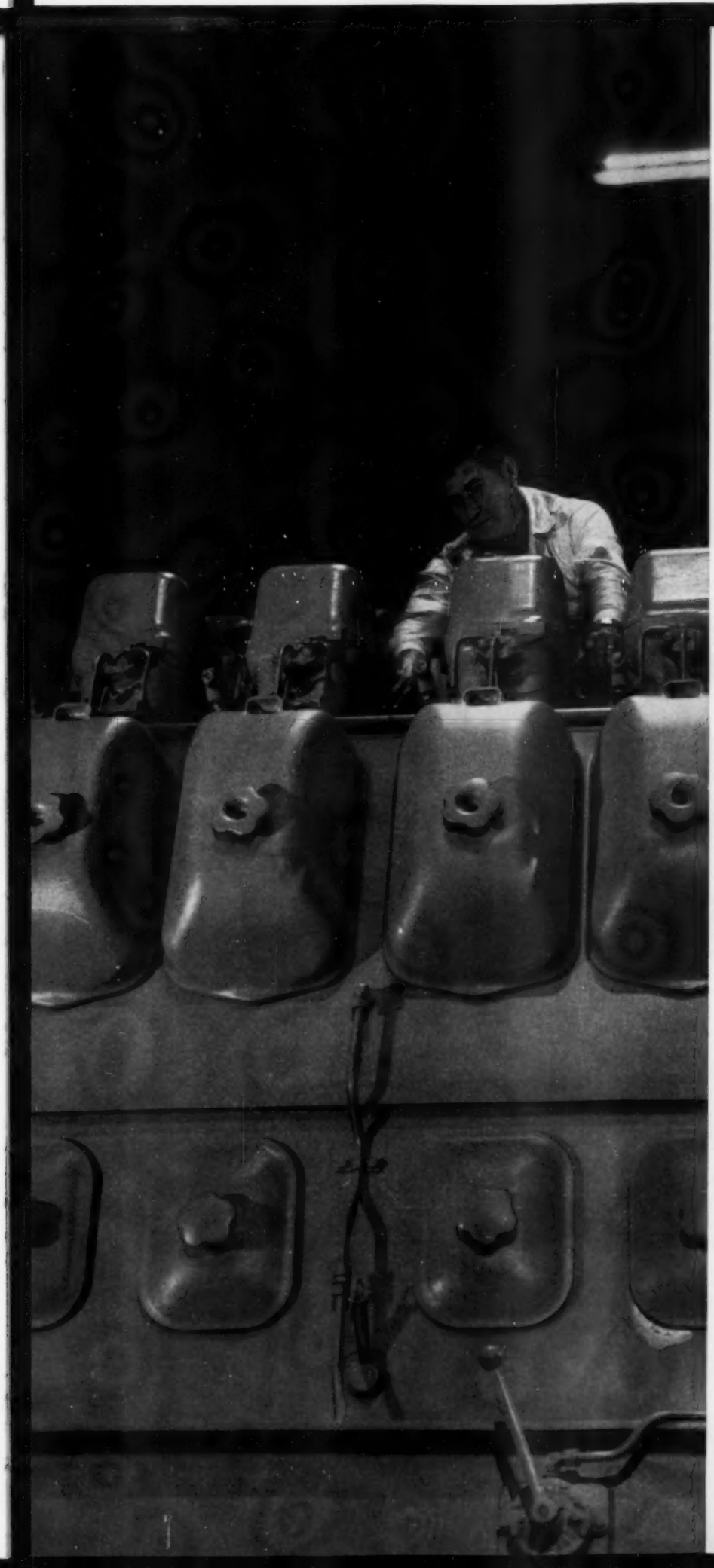
De Laval turbochargers offer pressure ratios of 3:1 as well as higher compressor and turbine efficiencies than those found in conventional turbocharger systems. Output of heavy duty diesel, gas and dual-fuel engines may be doubled by De Laval turbochargers without increasing thermal loading. Exclusive Monorotor design offers a compact lightweight unit of sturdy construction. De Laval turbochargers are self-adjusting to engine loads, can be used on 4- *and* 2-cycle engines.

You'll find additional data in these De Laval Bulletins. Write for your copies.

DE LAVAL

Steam Turbine Company

TRENTON 2, NEW JERSEY



AN ENGINE AS MODERN AS TODAY

The ALCO 251 diesel is modern for good reasons. The first: To save you money. ALCO engineers designed this engine with up-to-date materials, lowering maintenance and slashing weight. Through modern turbocharging and fuel injection they endowed it with more horsepower — reliable horsepower — to drive pumps, compressors, generators, shafts efficiently and economically.

All this means that you can install ALCO engines inexpensively. Heavy costly foundations, grouting, are unnecessary. It means, too, that maintenance costs are lower because modern materials wear longer, and the 251 diesel's design lets your maintenance people get into the engine faster. Replacement parts are readily available from ALCO's six regional warehouses.

ALCO can tell you much more about how the 251 diesel compares to "cast-iron" engines. Contact your nearest ALCO sales offices, or write Transportation Products, Dept. TR-5, P. O. Box 1065, Schenectady 1, N. Y.

Condensed Specifications* for ALCO 251 Diesels

No. Cyl.	Bore and Stroke (in.)	RPM Range	BHP Range	Approx. Wt Dry (lb)
6	9 x 10½	350-1000	330-900	22,100
12	9 x 10½	350-1000	1100-1800	32,650
16	9 x 10½	350-1000	1470-2400	42,000

*DEMA standards

ALCO

ALCO PRODUCTS, INC.

NEW YORK

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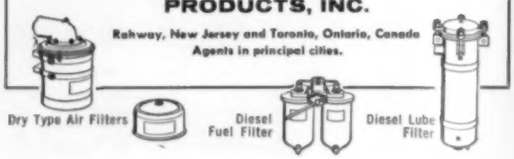
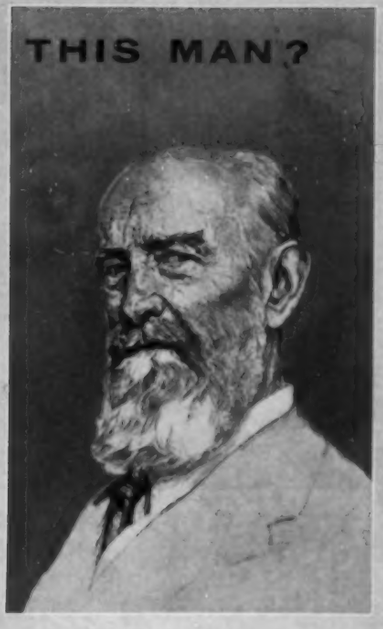


When several manufacturers install the same line of filters on a wide variety of equipment, there must be a good reason. For all the equipment shown above the reason is simply this: Purolator filters remove more dirt. That's all there is to it. In terms of engine wear, performance, and long life, this can mean the difference between dependable operation and breakdown. That's why more and more manufacturers of equipment which must operate in dirt and dust insist on the extra percentage of protection given by Purolator filters. Purolator's complete line for construction equipment includes filters for air, fuel, lubrication oils, and hydraulic systems; plus a complete line of screens and strainers.

DO YOU RECOGNIZE THIS MAN?

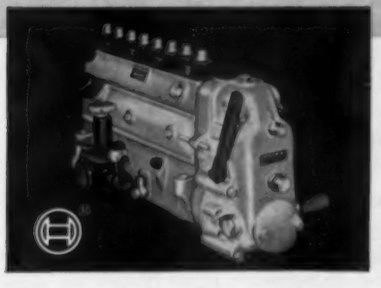


He made the high speed Diesel engine practicable.

Fuel injection equipment bearing his trademark has no peer for precision, quality, long-use dependability.

His name is Robert Bosch.

Millions of Robert Bosch Fuel Injection Pumps have been produced in the past 30 years. Their service facilities are nation-wide, world-wide. Here and abroad, leading engine manufacturers are selecting Robert Bosch Fuel Injection Equipment for their most advanced designs.



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Florida Diesel News

By **Ed Dennis**

THE *Indian Princess,* a 65 ft yacht owned by Mr. Williamson of Indiantown, Florida, was launched recently at Chris Boat Works. It is powered by two General Motors 6-71 turbo-charged diesels having a hp rating of 235 each at 2300 rpm. A 2 kw Onan diesel light plant was also installed.

WHEN Tropical Race Track opens this month it will have a model 6DAG-779 Allis Chalmers Buda diesel generating set. This 6 cyl diesel with 779 cu in. disp. is rated 128 hp at 1200 rpm. The unit is radiator cooled and complete with switchboard and a 250 gal. fuel oil tank. Peninsular Armature Works of Miami sold and installed this unit.

TWO S-7, 7 yd Euclid scrapers, powered with 4 cyl 93 hp General Motors series 71 diesel engines and Fuller Manufacturing Co. transmissions, were received from the Llewellyn Machinery Co. by the L. C. Morris Inc. company for airport improvement work.

FORT Myers Diesel Motor Sailer Inc. of North Fort Myers, are building several 40 ft motor sail boats which will have model 636 Mercedes Benz 37 hp diesel engines with 2:1 Paragon clutches.

A Cummins model HRBI 600 diesel is installed in the Bay City #70 one and a half yd dragline recently received by Capelletti Bros. This 6 cyl 4 cycle diesel is rated 165 hp at 1800 rpm. Also included was a Twin Disc #21-HC hydraulic coupling and Donaldson air filters.

REPOWERED from gasoline engines, the yacht *On Time* owned by the General Finance Co., with 2 6 cyl General Motors 71 series, diesels. Also included were 1.5:1 GM hydraulic r&r gears. It was sold and engineered by Ellis Diesel Engine Sales & Service of Ft. Lauderdale.

A 4 cyl Continental diesel engine was installed in the Case Terratrac #800 dozer, sold by Llewellyn Machinery Corp. for use on grade leveling work at the Bloom Bros. warehouse project.

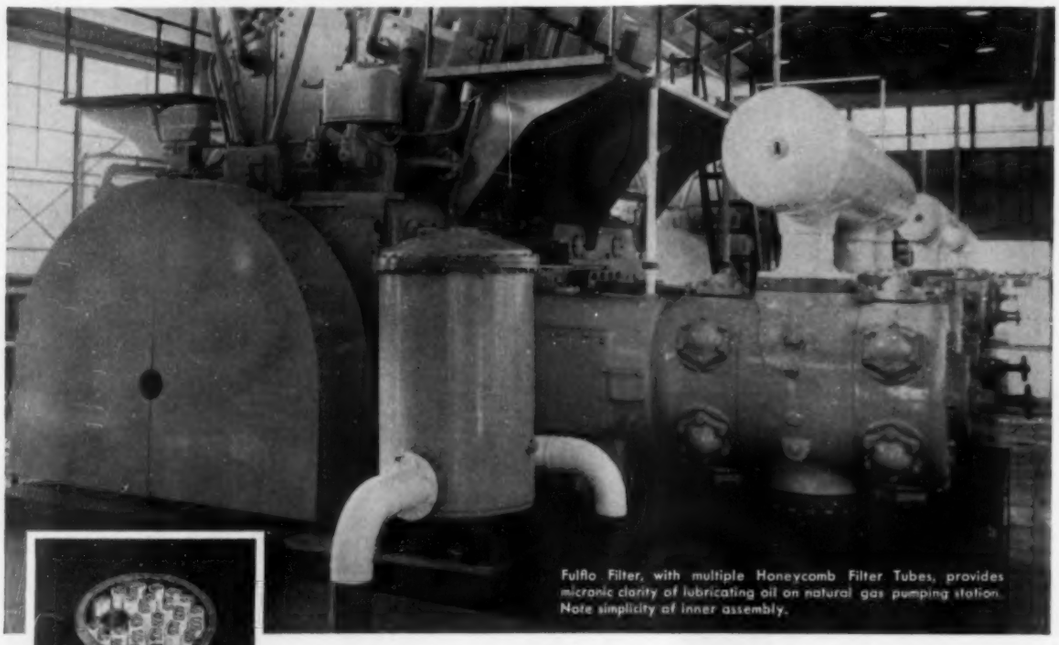
A GILDED sea lady is getting a new face at Miami Shipbuilding Corp. The 175 ft *Gosse,* an ex navy patrol vessel was converted into a plush yacht at a cost of a million dollars and now is getting another face lifting. Powered with two Hamilton R99DA diesels rated 1750 hp each at 700 rpm, the 350 ton vessel cruises at 19 knots. Two 8 cyl Superior diesels supply power for the air conditioning units. Two GM 6-71's are used for lighting purposes etc.

AT BARTOW, Frank M. Murphy Associates Inc. installed a model 8DC super charged Allis-Chalmers diesel engine, having a max hp of 508 at 1200 rpm, for powering the sand pump in a new dredge; the auxiliary equipment is powered by a model 6DA273 47 hp Allis-Chalmers diesel.

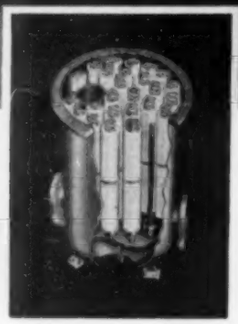
MIAMI Marine Engineers of Miami, Fla. have been appointed distributors for the Universal diesel engines for Southern Florida. They will also handle the marine end of Lister diesels.

AT CHRIS Boat Yard, two 40 ft sports fisherman vessels are being built. Each will be powered with 2GM 4-71 turbo charged inclined diesels with Paragon r&r gears. For lights etc., 4 cyl Kohler diesel generating units have been installed and Maxim MO silencers are being used.

AN Allis-Chalmers diesel will be powering the newly launched shrimper *Conquest II* when it fishes Florida waters soon. The model 6-DAMR-844 diesel swings a 44x36 four bladed Federal pro-



Fulflo Filter, with multiple Honeycomb Filter Tubes, provides micronic clarity of lubricating oil on natural gas pumping station. Note simplicity of inner assembly.



Fulflo Filters pioneered to give you longer engine life... low cost maintenance

Fulflo was the first successful application of a full-flow lubricating oil filter on high horsepower diesel engines. Now, Fulflo Filters provide micronic clarity of both fuel and lubricating oil for all sizes of stationary engines, mobile equipment and for bulk filtration. You save through reduced wear on injectors, reduced bearing wear, lower maintenance costs.

Exclusive Honeycomb Filter Tubes give you true depth filtration to any desired degree of micronic clarity. Densities are positively controlled in manufacture. Low-cost Honeycomb Filter Tubes are easy to replace. Don't accept substitutes!

CFC

CFC Honan-Crane Oil Filters employ a variety of filter media for removal of soluble as well as solid impurities. Multi-Cartridge Filter (illustrated) offers a choice of six types of interchangeable cartridges depending on type and degree of filtration desired. CFC Michiana Filters, with "throw-away" or repackable elements, provide especially low-cost filtration.

For engineering assistance or technical literature, write Department DS

Micro-Fine Filtration for Low Cost Clarity

COMMERCIAL FILTERS CORPORATION

MELROSE 76, MASSACHUSETTS

Plants in Melrose, Massachusetts and Lebanon, Indiana

FULFLO FILTERS WITH GENUINE HONEYCOMB FILTER TUBES FOR CONTROLLED MICRONIC CLARITY • CFC MULTI-CARTRIDGE OIL FILTERS
PURIVAC INSULATING OIL CONDITIONERS • DRI-PURE WATER-OIL SEPARATORS • PRE-COAT FILTERS • MAGNETIC SEPARATORS
AUTOMATIC TUBULAR CONVEYORS • COOLANT CLARIFIERS

peller through Capitol 3.88:1 hydraulic r&r gears. A Lister-Blackstone 3.5 hp diesel drives a Safety generator.

RECENTLY added to the Florida construction industry and powered with General Motors diesels were a model 1250 Baldwin-Lima-Hamilton excavator with a model 62408RD for E. L. Montgomery and a #71B Bucyrus-Erie 1½ yd crane with a 62306 RD diesel engine for Harry C. Delaney of Del Ray Beach.

A PETTER diesel is used for auxiliary purposes on the 67 ft *Mary and Janis* recently launched by Diesel Engine Sales at St. Augustine. The main propulsion is a D342 Caterpillar diesel rated 150 hp at 1225 rpm; Twin Disc power take-off 3:1 Snow Nabstedt r&r gears are also provided. Similar installations were made on the *Miss Carrie* and *Lou*.

TWO newly launched trawlers, from the Morehead City Shipbuilding Co., are the 58x17 *William B* and the *Tumbleweed*. Both have General Motors 6-71 diesels with 3.75:1 Twin Disc r&r gears and 40x32 four blade Federal propellers. The *Tumbleweed* has a fuel capacity of 3200 gal. for long distance fishing in the Gulf of Mexico.

AN Onan 3 kw diesel generating set was installed in the #54B Bucyrus-Erie dragline owned by Capelletti Bros., contractor for the Palmetto Express Highway. This will enable the dragline to work nights. The main engine is an Allis-Chalmers Buda diesel.

A Kato 12.5 kw generator, model 49-MPS4, 60 cycles 127-220 volts, powered by a Fairbanks-Morse 48 AG4¼, 2 cyl diesel engine, is an emergency unit at Pump Station #9, for lights, radio-telephone and etc., on the Everglades Flood Control Project.

A UD24 International 6 cyl diesel provides power for the Wood Pulverizer which has hydraulic controls. It is used by R. H. Wright & Sons for pulverizing rock on road construction work. The unit is pulled by a TD 18 International crawler tractor.

SEMINOLE Rock Co. took delivery of a Payloader tractor-shovel from Florida-Georgia Tractor Co. The model HOD is powered with a Cummins JN6BI diesel rated 122 hp at 2200 rpm through an Allison 3.5:1 torqmatic drive. This is a 4 yd job with hydraulic load shock absorber cushions plus planetary axles.

Appoint Five to Handle Field Sales

Appointment of five representatives to handle the company's line of electrical equipment is announced by Lake Shore Electric Corporation, Bedford, Ohio.

These include The Herbert J. Baer Co., P.O. Box 131, Richmond, Virginia. Baer will represent Lake Shore in Virginia. The C. B. Rogers Co., P.O. Box 1376 Clearwater, Florida, for all of Florida.

Hurbert Kaub, 1025 Santa Fe Drive, Denver, Colorado, will represent the company's entire line in Montana, Wyoming, Colorado, and New Mexico. The Davis Sales Co., 1291 Hazelwood Avenue, St. Paul, Minnesota, will represent the company in Wisconsin, Minnesota, Iowa, North and South Dakota. Roger Allen, C. B. Rogers & Associates, 1000 Peachtree Street N. E., Atlanta, Georgia, will represent the company's complete line in Georgia and South Carolina.

Lake Shore Electric Corporation is well-known for its line of switchboard, and power distribution systems; diesel generator controls and marine switchgear. More recently the company announced a new, safety-type automatic transfer switch; a diesel generator start cabinet with protective relays; and a floor mount diesel generator control cabinet for service to 250 kw, 440 V.

GENERAL MOTORS'

New 6000 S.H.P. Free-Piston-Gas-Turbine Power Plant successful in sea trials

9000-ton Liberty Ship—G.T.S. (Gas Turbine Ship) WILLIAM PATTERSON

First in the United States—and largest of its type in the world—General Motors' new Free-Piston-Gas-Turbine Engine marine installation has successfully passed sea trials in the converted Liberty Ship WILLIAM PATTERSON, which will be operated in transatlantic service for the Government by Lykes Brothers Steamship Company.

This great new marine power plant was engineered and developed by Cleveland Diesel, aided by hundreds of scientists and engineers at General Motors' vast Technical Center in Detroit, other Divisions of General Motors and SEME-SIGMA, France.

It was installed in the WILLIAM PATTERSON by the Bethlehem Steel Company Shipbuilding Division, Baltimore Yard, under the direction of the Office of Ship Repair and Construction, Maritime Administration, U. S. Department of Commerce.

The success of this new Free-Piston-Gas-Turbine power plant marks a big forward step in the Maritime Administration's program to improve the performance standards of America's Liberty Ships.

It holds tremendous promise for the future as General Motors engineers work on continuing improvements as well as other applications for this new form of power.

CLEVELAND DIESEL

ENGINE DIVISION OF GENERAL MOTORS, Cleveland 11, Ohio

CLEVELAND DIESEL

Inland River Reports

By A. D. Burroughs

OF THE many new towboats plying inland rivers, the new *U.S. Steel No. 1* with its all-stainless-steel hull has received its share of river comments. Built by St. Louis Shipbuilding and Steel Co., for special service in the Monongahela waters for owners, the United States Steel Corp., the twin-screw craft is equipped with two Caterpillar engines for the rated 400 hp.

A COUPLE of Enterprise engines power the 2400 hp twin-screw towboat, the *Hamilton*. The newest fleet addition for the Canal Barge Company, this pretty new 128 by 35 ft towboat has the retractable pilothouse for Illinois Waterway service. Delivery was made by St. Louis Shipbuilding and Steel Co.

THE excellent photo received of the new *Asa* in action coincided with the reports of performance suggesting that this 75 by 22 ft tug performs as well as she looks. Built by the Bryant Boats, Inc. at Bayou LaBatre, Ala. for A. P. Ward and Son, the power is furnished by two Superior Model M 5x8 engines, each rated at 650 hp. Snow-Nabstedt reduction gears and Waukesha generators, along with Kahlenberg air horn and Hilco oil filters are included on the equipment listing.

ANOTHER Louisiana-built craft is the new *Sioux City*, built by M. Rodrigue and Son Shipyard, Valcherie, La., for operation by Guarisco Construction Company. Measuring 56 by 18 ft, equipment includes two Caterpillar Model D 342 engines, Twin Disc reduction gears, Onan generator, and a Model D-2 Kahlenberg airhorn.

PROOF that one good thing often follows another is the brand-new beauty, the *I. F. Freiberger*, delivered by Dravo to owners Island Creek Fuel and Transportation Company, Huntington, W. Va. A sister towboat to the highly successful *Raymond E. Salvati*, power for this sixth addition to the Island Creek's diesel fleet comes from two Model DMG-38 Enterprise engines for the total 2650 hp.

THE SAFETY features and some of the engineering designs on the new towboat, the *Boaz*, have created inland river interest. Owned by the Monongahela and Ohio Dredging Co., the twin-screw towboat was built by Yates Marine Construction, Wheeling Island, with power supplied by two General Motors diesel engines rated at 400 hp.

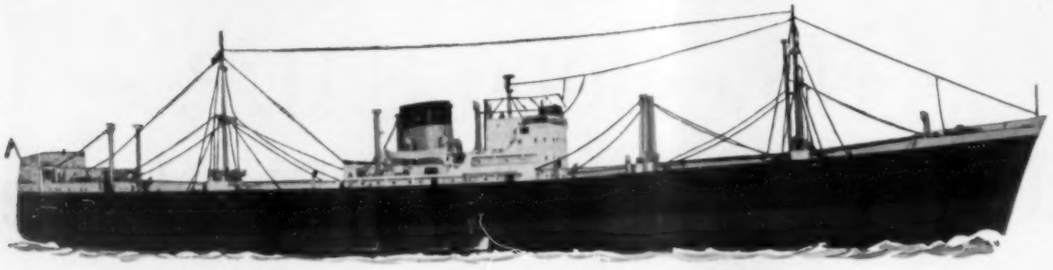
THE NEW 50 by 15 ft single-screw steel tug, the *Beatrice T.*, delivered by Pelican Iron Works for Eustis A. Theriot, Houma, La., is performing well with power provided from the 155 Murphy diesel engine.

AN all-purpose supply vessel named *Botruc* is the newest diesel addition to the fast-expanding fleet owned by Miner and Lefty Cheramie, Harvey, La. The twin-screw craft has a pair of GM (Detroit) engines, Model 62206Lb and RD, symmetrically matched for steady supply of performance power.

OLD FRIENDS were at work, too, on all the inland waterways. On the Illinois Waterways, we saw the favorite *St. Paul Socony*, the Ingalls production of 1940, using the 1500 hp from the Superior engines well for owner Socony-Oil Co., with a tow of petroleum products.

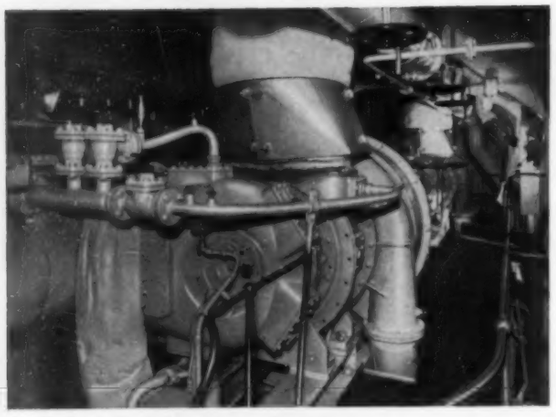
RAPID CITIES was another well-known towboat spotted in this area, using the 1800 hp from General Motors engines. Built in 1952 by the Texas firm, Parker Bros. & Co., this worker is owned by the New York firm, Lake Tankers Corp.

DOWN on the Mississippi River, we



New cargo ship "Cloverbank"

Napier Turbo-blowers, with their high adiabatic efficiency, give the new Bank Line "Cloverbank" greater engine power, smoother running, lower specific fuel consumption. Built by Harland & Wolff Ltd., the "Cloverbank" has a Harland single-acting 2-stroke engine fitted with two Napier MS 500 Turbo-blowers. Napier blowers are available in seven sizes for engines of approximately 140-4,000 h.p. afloat and ashore, and in multiple installations for engines of higher powers. They can double the power of 4-stroke diesels and increase that of 2-strokes by over 30%—often at a lower specific consumption. Napier's long experience in precision engineering guarantees a high standard of workmanship, and there is a world-wide service and spares organisation. Napier blowers are currently in use in 84 countries.



gets greater, smoother power from

NAPIER Turbo-blowers

D. NAPIER & SON LIMITED • LONDON • W.3 • ENGLAND

Representative: L. O. Brooks, 909 Dupont Circle Bldg., 1346 Connecticut Ave. N.W., Washington 6, D.C. Phone: North 7-0146

CRC T17

continued spotting the "regulars". The seventeen-year-old *Mary B* with new power from the pair of Model 38 Fairbanks Morse OP engines delivering the rated 1600 hp for B & M Towing Co., is a familiar sight.

THE BIG *Fort Dearborn*, built in 1947 by St. Louis Ship, owned by John I. Hay Co., Chicago, was seen several times on the Mississippi. Measuring 154x35 ft, with the 3000 hp provided by the Fairbanks-Morse OP engines, this long faithful towboat was one of the 'firstest with the mostest", in the current-day trend of bigness in size and power.

THE *Valley Transporter* with Nordberg power passed as we watched at Greenville, Miss. Back in regular service, she is a popular boat along the Mississippi.

UNION Barge Lines' famous twoboat, the *Peace*, is still going strong after 23 years of service on the Ohio River. Built by Dravo in 1934, the present 1500 hp comes from the GM engines installed in 1948.

LITTLE ALEX, the familiar harborboat of the Pittsburgh Consolidation Coal Company, equipped with a Murray and Tregurtha Harbormaster engine for the 155 hp, will reportedly sport a new name, the *Elizabeth*, honoring the owner's home port.

THE *C.M. II* is the recently delivered 48 by 15 ft towboat, the fifth of a series completed by the Marietta Manufacturing Company for the Columbia Marine Service, Cincinnati. Power comes from two General Motors (Detroit) Model 6-110 engines.

A PAIR of 1600 hp GM's (Cleveland) supply the propulsion power for the new *City of Greenville*, the new towboat operated by the Valley Towing Company. Measuring 110 by 30 ft, the hull was built by the Greenville Manufacturing and Machine Works.

Director of Engineering

P. H. Spennetta, former Chief of Research and Testing for the Caterpillar Tractor Co., has joined the engineering staff of J. I. Case Co., Racine, Wis. as Director of Engineering for the Industrial Division. In making the announcement, M. B. Rojtman, Executive Vice President and General Manager, stated "Mr. Spennetta is recognized as one of the nation's foremost tractor research engineers. His vast knowledge of crawler tractors and equipment, gained through 20 years of testing all types of Caterpillar and competitive units, will prove extremely valuable in the extensive industrial development program now underway at Case."

Rojtman also announced the promotion of T. A. Haller, former Case Director of Engineering, Industrial Division, to head up the newly established Research and Development Center in Racine. Haller, who served as Chief Development Engineer of Allis-Chalmers' construction machinery division and Vice President in Charge of Engineering for American Tractor Corp. before that company merged with Case, will move from the Churubusco Indiana works to the company's executive headquarters in Racine, Wis., where he will have overall supervision of engineering for both the Agricultural and Industrial Divisions. Spennetta and K. L. Magee, Case's Director of Agricultural Engineering, will work directly with Haller. "We feel this new executive organization will give us better integration of the two engineering departments, and will promote a beneficial exchange of ideas and information," Rojtman said.

Planning and doing can be exaggerated both ways. On the one hand it is all talk and on the other hand it is all bull in the china closet. Neither has any relationship to good engineering and well planned scheduling of work.

WINSLOW
Full-Flow
FILTERS

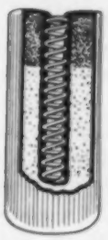
Case History Report No. 38 Shows Why Engines Protected by WINSLOW FILTERS Last Longer

CONTINENTAL TRAILWAYS installs WINSLOW FILTERS on DIESEL BUSES

Following more than two years of exhaustive testing, Winslow full-flow Filters, Model 8-931-E, are installed on Cummins JT engines that power interstate buses for Continental Trailways.

As they have for many other major fleets, Winslow Filters reduce engine wear and lower maintenance costs for Continental Trailways. This modern full-flow filtration increases the useful life of lube oil and of filter elements, and protects engines under all conditions of service and temperature.

**CP is fully protected by patents and trademarks*



CP* FILTRATION

Winslow patented CP* (Controlled Pressure) elements are designed to continuously self-adjust the pressure within the filter and allow for a full stream of filtered oil without opening by-pass valves. This is accomplished through the dual flow capacity, with two types of material in the same element.

WINSLOW ENGINEERING & MANUFACTURING COMPANY
4069 Hollis Street, Oakland, California

W-2595-A

AIRESEARCH TURBOCHARGERS
add power to new
ALLIS-CHALMERS CRAWLER TRACTORS

Giant new HD-21 demonstrates how a turbocharged tractor can make the big jobs easy

AiResearch C-60D Turbocharger

Allis-Chalmers, one of the leading producers of construction machinery, has selected AiResearch turbochargers as standard equipment on their new HD-21 crawler tractors. The engines of these powerful earthmovers develop 225 hp at the flywheel and 70,000 lb pull at the drawbar.

Benefits of AiResearch turbocharging include increased power output; better specific fuel consumption; sea level performance at altitude; lower engine thermal loading; and greatly decreased smoking and noise.

Reliability, high performance and long life have been proved by thousands of AiResearch turbochargers already operating in the field in all types of applications. Being air cooled, they require no complicated plumbing. They need no maintenance between normal engine overhaul periods.

• *Your inquiries are invited.*

BASIC SPECIFICATIONS FOR AIRESEARCH TURBOCHARGERS

MODEL	F-51	C-60	A-60	E-100	B-100
Output—lb/min. (Standard Conditions)	29-51	30-60	38-60	50-100	60-100
Diameter—in. nom.	10.0	11.5	15.25	15.1	15.4
Length—in.	10.5	12.9	16.75	14.7	17.1
Weight—lb.	40.0	95.0	125.0	112.0	135.0

THE GARRETT CORPORATION

AiResearch Industrial Division

9225 South Aviation Blvd., Los Angeles 45, California

DESIGNERS AND MANUFACTURERS OF TURBOCHARGERS AND SPECIALIZED INDUSTRIAL PRODUCTS

THE FORD FREE PISTON ENGINE TRACTOR

By JIM BROWN*

THE Ford Motor Company started their Free Piston Engine Program in February 1954. They now have under exhaustive tests a 4200 lb, 99 in. wheelbase row-crop farm tractor powered by their model 519 free piston gasifier supplying a 5½ in. gas turbine. This experimental tractor, called the "Typhoon" has been purposely held down to a 50 hp drawbar output, although the same gasifier, with selected turbines, could be made to produce 75, 100 or as much as 150 hp with no basic design change.

DIESEL PROGRESS has printed several discussions of the free-piston engine developments of other manufacturers in this country. Basically the free-piston gasifier is an opposed-piston 2-cycle diesel engine, so its development falls properly within the diesel engine field. As to what its future may be, compared to constantly improved internal combustion engines of the crankshaft type, to recirculating gas turbines or to the still farther away atomic power, no one ventures to guess. Even the developers of the free-piston-gasifier gas turbine power plants hold themselves to the cautious statement that they look very promising. Looking at the tremendous (and still developing) potential of the farm tractor field, Merritt D. Hill, general manager of Ford's Tractor and Implement Division is somewhat more enthusiastic, saying: "We have high hopes that the experimental Typhoon tractor may be the forerunner of a totally new concept of farm power.

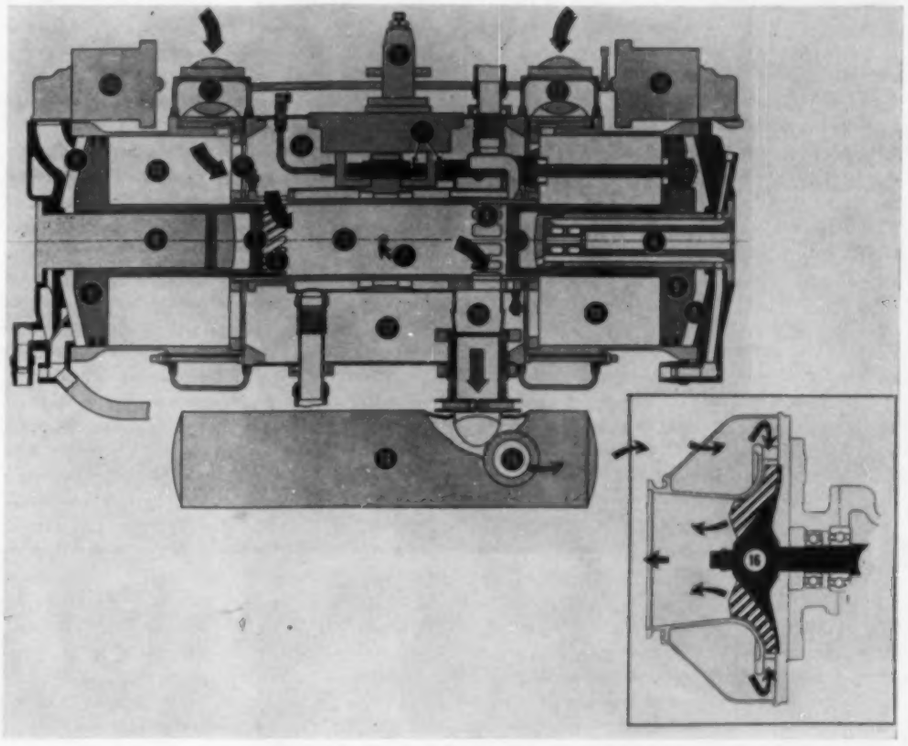


Fig. 1—How the Ford gasifier runs.

Heart of Ford Motor Company's free piston turbine engine which powers the Typhoon experimental tractor is this gas generator, or gasifier, shown in cross section. The gasifier is a two cycle engine, having a compression stroke and a power stroke. Insert shows the turbine (not drawn to scale). Combustion cylinder (1) with fuel injector nozzle (2) is water cooled along its length. Intake ports are at (3) and exhaust ports are at (4). Two "free" pistons (5) are linked together mechanically by a rack and pinion arrangement (6) so that they move inward and outward the same distance and at the same time. The fuel injector pump (7) is driven by a cam on one of the racks. The pistons slide on fixed supports (8) and are oil cooled and lubricated as they move. In the position shown, the pistons have compressed the air in the "bounce" cylinders (9). This air acting as a spring will force the pistons toward the middle of the combustion cylinder. During the compression stroke, air is shoved from the compression cylinders (10) through reed valves (11) into the air "box" (12). Entrapped air in the combustion cylinder is also compressed, reaching the ignition temperature at the time fuel is injected. On the power stroke, the pistons are forced outward by the expansion of burning gases. This movement uncovers the exhaust ports first, allowing most of the heated gas to leave the cylinder through the exhaust tube (13). Then the intake ports are uncovered, and air from the air "box" flows through the cylinder, thoroughly scavenging it and mixing with the hot gases in the surge tank (14). The outward moving pistons compress air in the "bounce" cylinders, and this compressed air again provides the rebound to move the pistons inward for the compression stroke. The diluted hot gases flow from the surge tank through a port (15) to the turbine wheel (16). The revolving turbine wheel supplies power to the tractor. As the pistons move outward after the fuel charge has been ignited, outside air is pulled into the compression cylinders through butterfly and reed valves at the air intakes (17). To activate the pistons for the initial start of the engine, a vacuum pump (not shown) draws air out of the "bounce" cylinders to pull the pistons back into the position shown. Starting "cans" (18) then provide a measured

Detroit Editor Diesel Progress

Fig. 2

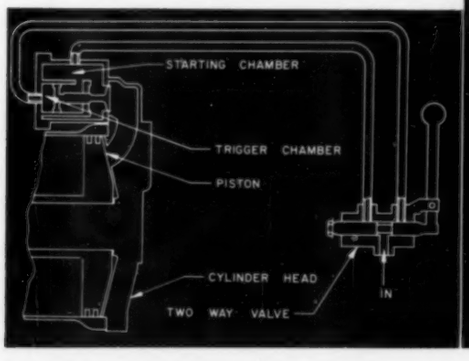


Fig. 3

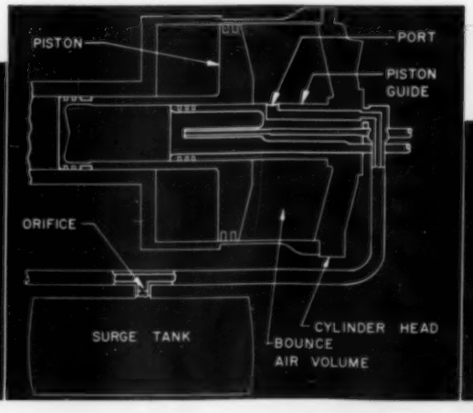
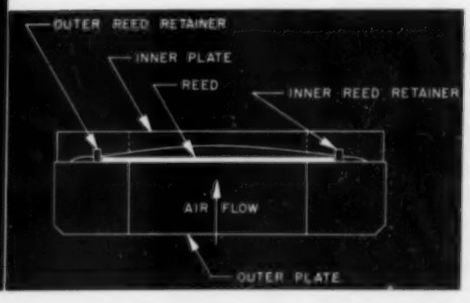


Fig. 4



amount of air under pressure to the "bounce" cylinders to force the pistons inward for the initial compression.

Those who are acquainted with the engine field and particularly with the requirements of any successful farm tractor engine will be able to see reasons for Mr. Hill's optimism regarding the farm field as a market for this type of power plant. Diesel fuel economy has been attractive to farmers for a long time. This is evidenced by the increasing number of diesel farm tractors being manufactured and sold. However one requirement of the farm tractor has always been that it not demand too great a capital investment. Price could be the greatest deterrent to selling diesels to the farmer as he is often reluctant to trade a high investment for long-term economies. So the manufacturing cost and price of diesel farm tractors must be within reason. The free-piston gasifier and turbine hold promise in this area because a basic cylinder with a single pair of pistons can be made to produce a wide range of horsepower. From this factor rises a whole string of possible manufacturing savings—less tooling costs, fewer basic models, less complicated parts inventories and so on.

Other basic advantages pointed out by Ford spokesmen are the ability of this type engine to burn a wide range of fuels (some of which may eventually be derived as by-products of agriculture); fewer parts subjected to heavy bearing loads and the very advantageous torque characteristics of the turbine which converts the gasifier's exhaust into rotative power. For the general scheme of operation of Ford's free-piston gasifier and turbine engine we refer you to Figure 1 and its accompanying explanation. Since some of the engine's features are not fully explained by this however, some of them are more fully described in the following paragraphs. The Ford 519 gasifier is started as follows: An electrically driven vacuum pump pulls the compressor pistons into correct position in the bounce chamber, then high-pressure air from an air bottle mounted alongside the fuel tank is admitted by a three-way valve successively into the "starting cans" and a "trigger chamber" as shown in Figure 2. The trigger chamber dumps the air from the starting cans into the bounce chambers forcing the pistons toward each other on the compression stroke. There is no repetitive "cranking" of the engine. If the engine should not fire on the first compression stroke (which is unlikely) the process is repeated. The starting air bottle is automatically recharged to more than the required starting pressure by the engine through a "tapping valve" leading to the combustion chamber.

In the Ford free-piston engine the piston guides (No. 8 in Figure 1) serve three purposes: they help support the free-sliding pistons, they conduct oil to the under side of the pistons for lubrication and cooling and they provide a means for stroke control. Bounce control ports in the piston guides are connected to the surge tank which is at turbine inlet pressure. (See Fig. 3) These ports, exposed by the inward travel of the piston, serve to adjust the pressure in the bounce chambers. When the bounce volume has been properly selected, in relation to the position of the control ports, automatic stroke control is maintained over the full load-range of the engine. Load control of the engine is accomplished by a single link to the compressor inlet throttles, which are mechanically connected to the fuel injection pump racks through an adjustable ratio linkage. This system provides fuel and air metering to the gasifier in predetermined proportions dictated by the gas horsepower required. There is no control connection between the turbine and the gasifier except as provided by the turbine's speed-sensitive governor.

Although Ford engineers have their eye on the manufacturing economies that would result from a single cam-operated fuel pump and nozzle, best results as to cam loading have so far been found by using two smaller pumps and injectors. Since the free piston gasifier has no flywheel or other rotating members and since fuel injection has to be maintained beyond the end of the compression stroke, fuel injection has always been one of the problems of free piston engine design. In the 519 gasifier, the fuel injector pumps are driven by linear cams with cycloidal contours. These cams, mounted on the piston-synchronizing rods, move exactly as the pistons do. Prolongation of the injection period is accomplished partly by use of a delivery or delay line of exaggerated length leading to the fuel nozzle. By experimenting with different pumps, Ford engineers have been able to shorten the delay line from 84 inches to 20 inches and hope for further progress. The fuel consumption of the 519 gasifier, even at this stage of development is comparable to most automotive diesels, being about 0.45 lbs per gasifier hp/hr.

Although the 519 gasifier has a mechanical (swept volume) compression ratio of only 15:1 it actually provides much higher compression pressures, even in normal operation. The amount of compression is a product of the bounce chamber pressure and the amount of supercharging from the air-compressor-fed air box which may run as high as 40 to 70 psi. Thus in normal operation compression ratios run in the 21:1 to 26:1 range and the gasifier can produce compression ratios as high as 50:1. Compressions possibly account for its being able to run cleanly and economically on a wide range of fuels. With improvement of the fuel injection methods (now under study) greater economy is predicted. Valving—The only combustion-chamber valving in this engine is accomplished through the use of cylinder-liner ports. Air intake and exhaust valves for the compressor chamber are subjected to only 60 psi of pressure and to relatively low temperatures. The compressor intake valves consist of 24 pads of reed valves (12 per cylinder) which provide a total of 144 reed valves for intake. The compressor discharge valve plates have 40 valves per cylinder. A diagram showing the reed valve construction is shown in Figure 4.

Lubrication and cooling—As mentioned above, the back sides of the gasifier power pistons are cooled by a spray of oil from the piston guides. The same oil is used to lubricate the compressor pistons through a controlled leakage path. The power pistons (or power end of the pistons) are lubricated by applying oil directly to the ring area. Oil is supplied to the power pistons by a metering pump. An oil pressure pump driven off the gearbox recirculates the piston cooling oil. The power cylinder is water-jacketed and cooled by water circulated through the radiator. The water pump

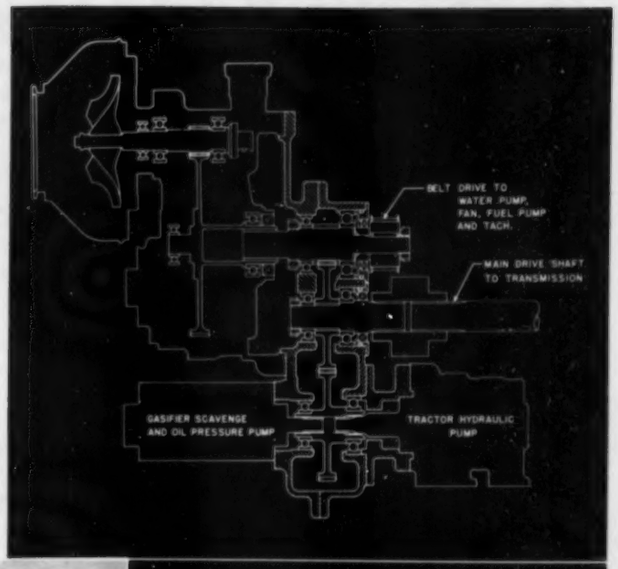
and radiator fan are belt-driven off the accessory drive gearbox. Dr. A. A. Kucher, Ford Motor Company, Vice President in charge of the Engineering Staff, points out that lubrication requirements are not severe because the power is not transmitted mechanically through rod and crankshaft bearings. He also points out the elimination of oil dilution. A separate radiator-mounted oil cooler is provided for the turbine and a section of the radiator cools the gasifier piston-cooling and compressor-lubricating oil.

Gearing and accessories—Power from the 43,000 (max. governed) rpm turbine is transmitted through a 7.17 reduction gear to an accessory drive gearbox which has a 3:1 reduction, making the overall reduction ahead of the transmission 21.5:1. Input speed to the transmission thus becomes 2000 rpm. The accessory drive gearbox carries a pulley which belt-drives the water pump, fan, fuel pump and tachometer. Through gears the accessory drive gearbox also powers the gasifier scavenge and oil pressure pump, a hydraulic pump for farm implement control and the generator and power steering pump. Figure 5 shows the arrangement of these accessory drives, (except for the generator and power steering pump) in a schematic drawing. All of these accessories are grouped in the turbine area just back of the radiator. The main drive shaft to the transmission runs aft, under the gasifier unit to the transmission. The transmission (also experimental) is a full power shift unit with 10 speeds forward and 2 in reverse.

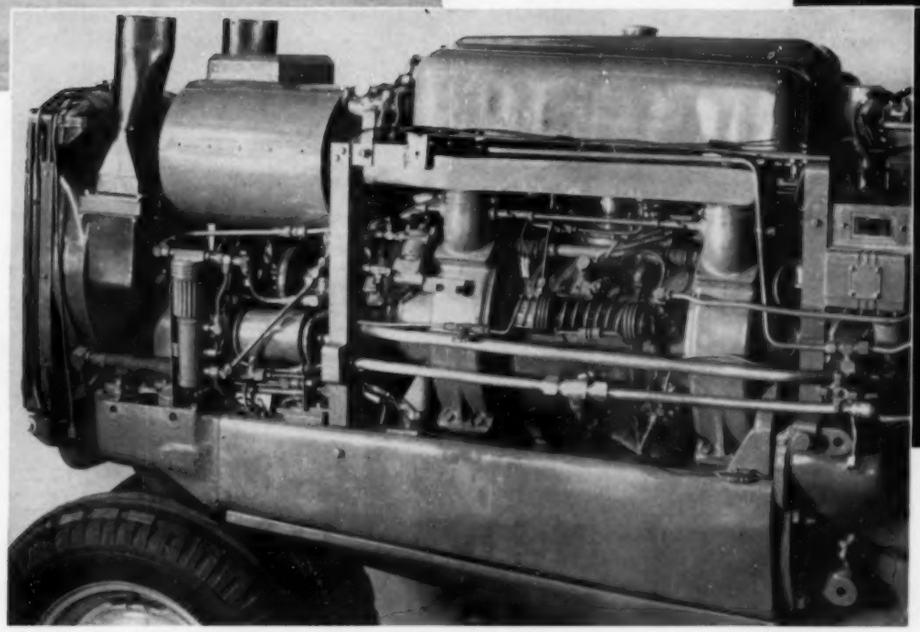
R. J. Miller, manager of the mechanical department of Ford's Scientific Laboratory explained to us that the 10-speed transmission was necessary only to maintain, under different operating conditions, the critical speeds required of farm tractors when pulling PTO-operated machinery such as combines. Otherwise a 3-speeds-forward transmission would serve. The full power shift feature enables the operator to shift, with a finger-tip selector lever, into or through all the gear ratios

Three men closely associated with the development of the Ford Free Piston Tractor. (Left to right) Paul Klotsch, manager, mechanical department, Scientific Laboratory, Engineering Staff; R. J. Miller, manager of general engineering and research, Tractor and Implement Division; and Oscar B. Noren, project engineer.

Fig. 5


BELT DRIVE TO WATER PUMP, FAN, FUEL PUMP AND TACH.
MAIN DRIVE SHAFT TO TRANSMISSION
GASIFIER SCAVENGE AND OIL PRESSURE PUMP
TRACTOR HYDRAULIC PUMP

Left side of the experimental Typhoon with its free piston turbine engine exposed reveals the air-intake system as well as the fuel tank. The black tubes behind the radiator carry exhaust gases away from the turbine.



ENGINE

Type:	Free piston gas generator-turbine, two-stroke diesel cycle
Number of Engine Cylinders:	One, with two horizontally opposed free pistons
Engine Cylinder Dimensions:	
Bore	3.75 inches
Effective Engine Stroke	4.2 inches
Mechanical Compression Ratio	15 to 1
Gas Temperatures:	
At time of ignition	1000°F. Max.
At turbine inlet	940-960°F. Max.
At turbine exhaust	730°F. Max.
Pressures:	
Air box at intake ports	22-40 psi
Surge tank	16-27 psi
At turbine	15-25 psi
Ratio, turbine revolutions to rear wheel revolutions (in first gear)	3600 to 1

Fig. 6

without stopping, manual clutching or interrupting the power flow. Feathering is provided for attaching implements or slowly starting a load in any pre-selected gear. A "park" position on the gear selector locks the tractor wheels by applying the internal transmission brakes.

The Free-piston Gasifier-Turbine combination, as a prime mover for tractors has many possible advantages. Among these are the possible manufacturing economies of the gasifier unit as explained above and the fact that since the gases produced are of low (approximately 900°F) temperatures, the turbine does not require critical or very expensive materials. Disassembly of the gasifier (for inspection, ring replacement or complete overhaul) involves only removing the compressor heads. Absence of many of the customary engine parts and of heavily loaded bearings should further decrease maintenance costs. One of the principal advantages of this type of power however lies in the torque characteristics of the turbine, which operates somewhat like a hydraulic torque converter in that the torque increases as the speed is decreased. Thus in a farm tractor when tough going is encountered instead of having an engine which will fade out or stall, the turbine drive applies more pulling power to the wheels with a fluid smoothness and tends to maintain forward motion in spite of the obstacle. The balanced, reciprocating pistons in the gasifier produce power with an astonishing lack of vibration and are able to accelerate almost instantly to meet any power demand. Starting and stopping of the gasifier are also practically instantaneous. Weight, as such, is not a critical factor in a tractor, but the gasifier-turbine unit, including the necessary reduction gearing compares very favorably in both size and weight with diesel engines of equivalent horsepower.

In a description of this length it is impossible to more than touch on the highlights of this unique, experimental farm tractor power plant. To quote Ford's Engineering Vice President, Dr. Kucher: "It must be borne in mind that this is an experimental embodiment of a new concept in farm power. It cannot be assumed that this device is ready for manufacture and sale. Rather, it is an example of the forward concepts being applied."

The independent power take-off system of the experimental Typhoon tractor is shown being tested with a Ford six-foot combine. Tractor and Implement Division Test Engineer, A. M. LaRou, demonstrates the ability of the turbine-powered tractor to run PTO-operated implements with the tractor moving or stationary. The PTO has standard dimensions and is conventionally located.

PENROD DRILLING CO'S *JIM WOODRUFF*

GRATITUDE to a long-time employee took tangible form on June 11, when Penrod Drilling Co. launched the *Jim Woodruff Barge No. 51* at the Bethlehem Shipbuilding Division yards in Beaumont, Texas. The newest diesel-electric drilling barge to join Penrod's off-shore fleet is named for Jim Woodruff, a life-long oil field worker and veteran Penrod driller. Mrs. Dolly Woodruff performed the traditional christening honors and gave the drilling unit her husband's name before a crowd of approximately 300. Participating in the ceremonies were E. C. Rechtin, Gulf Coast District General Manager of Bethlehem Steel Co.; Herbert and Bunker Hunt, of Penrod Drilling Co.; and J. J. Johnson, Penrod's drilling superintendent. Also present at the ceremonies were Clyde Kraft and Sam Keene, who will be tool pushers on the new barge. The new multi-million dollar barge underwent submerging tests in the Neches River after commissioning, and upon their successful completion was towed to its initial drilling location in West Delta Block 51. There it is drilling under contract to the California Company in 30 ft. of water. Designed by Friede and Goldman, Inc., naval architects, the rig is capable of drilling to depths exceeding 20,000 ft. The massive diesel-electric platform is designed as a self-stabilizing submersible unit, fitted out for operation in 75 ft of water during non-hurricane season, and 45-foot water in hurricane season. Overall structure of the vessel consists basically of an elevated tri-level drilling platform, containing all machinery necessary to sustain drilling, mounted on ten supporting legs over a barge-type slotted hull.

The barge is 190 ft long and 150 ft wide, with a depth of 12 ft. The elevated platform is supported 90 ft above the bottom of the hull, and when under tow the unit has a mean draft of 6 ft 7 in. Located in the main machinery area on the lower deck of the elevated platform are the eight roots-blown Caterpillar D397 diesel engines that supply prime power for the rig's operation. These 12 cylinder, 5¾ in. bore 8 in. stroke engines are rated at 450 continuous hp at 1200 rpm. Five of the main engines are equipped with General Electric 600 hp differential compound dc generators, and supply power to electric motors mounted on the drilling equipment. A total of seven General Electric electric motors are unitized on the drawworks, mud pumps, and rotary table. The drawworks is a Continental-Emsco, and is powered by two GE electric motors, each with a 1000 hp intermittent rating. The rotary table is also a Continental-Emsco, driven by one GE motor, rated at 625 hp continuous. The rig's two mud pumps, located in the engine room, are National Model G-1000 pumps, having a 7¾ in. bore by 16 in. stroke, and are rated at 1000 input hp at 65 strokes per minute. Each mud pump is powered by two electric motors, individually rated at 625 hp continuous.

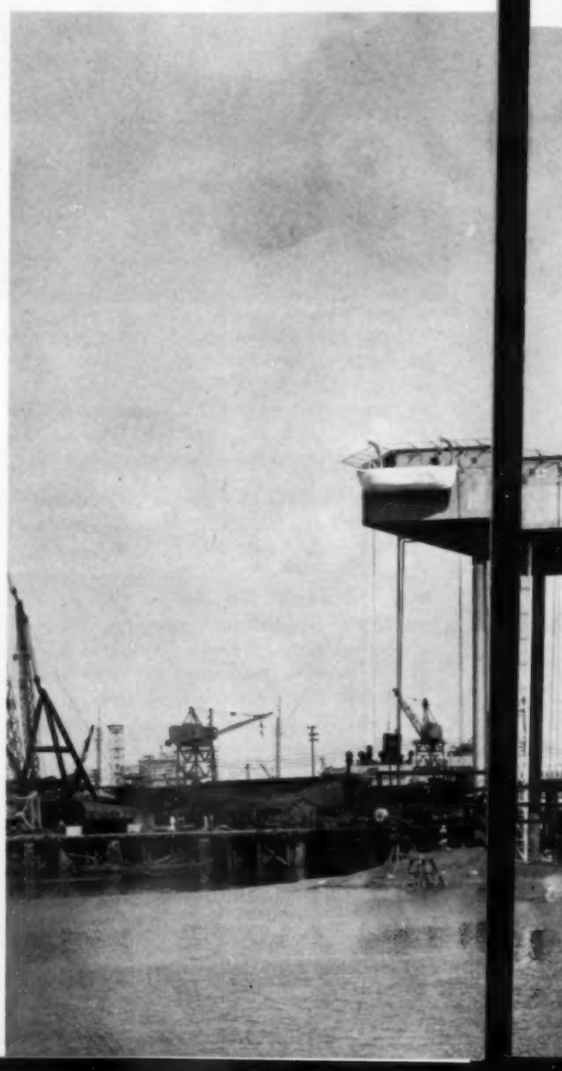
Field excitation is provided for the dc generators by two motor-generator sets located in an area forward of the main engine room. The excitation sets consist of General Electric 60 hp, 220-440 volt ac motors driving GE 35 kw, 125-volt, 1750 rpm compound-wound dc generators. Excitation is supplied by one set, with the other serving as standby. Power to meet the drilling unit's other electrical requirements is provided by three Caterpillar D397 roots-blown diesel engines, equipped with General Electric 300 kw, 60-cycle, 480 volt, 1200 rpm ac synchronous generators. Excitation for these AC generators is supplied by top-mounted GE, 5 kw, 125-volt, 1750 rpm shunt-wound dc generators.

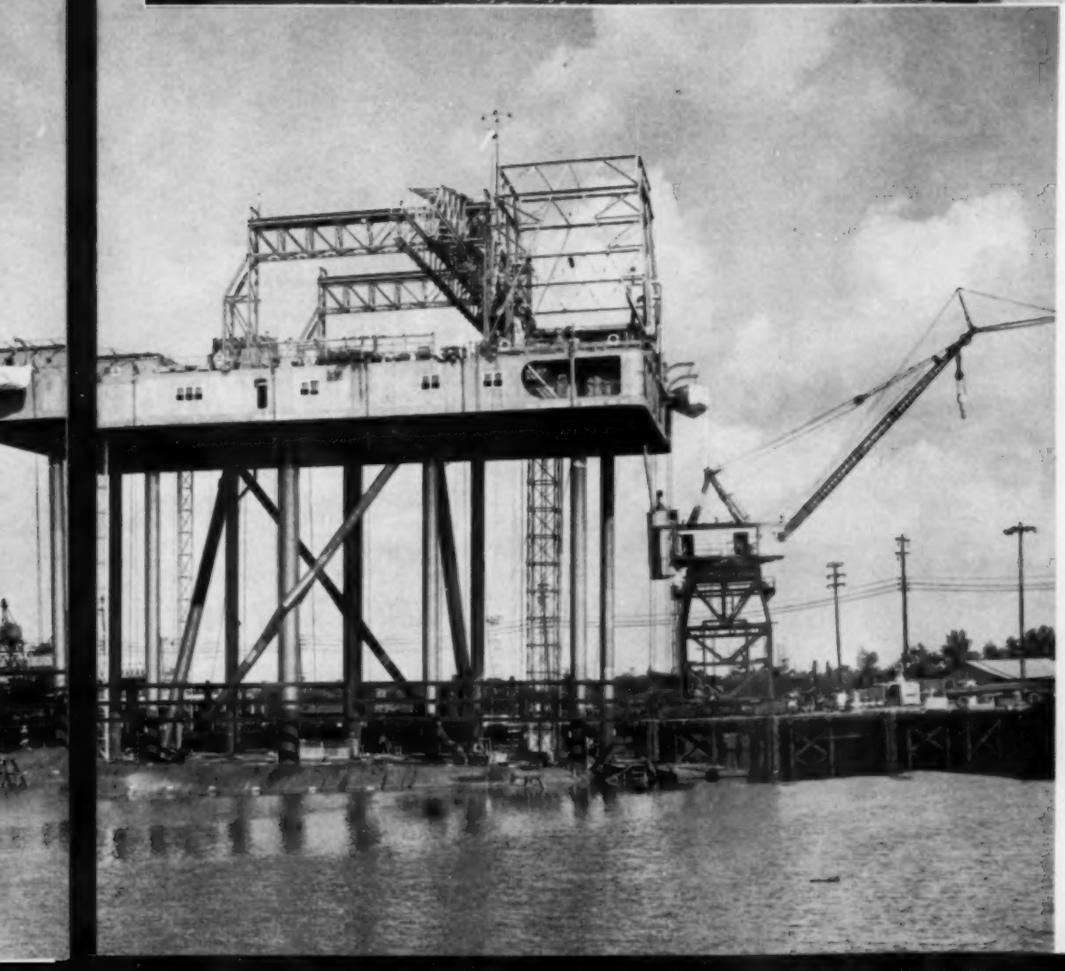
The main diesel engines are heat exchanger cooled, and are equipped with overspeed shut-offs, safety alarms for oil pressure and water temperature and a remote air emergency shut-off. In addition, the No. 1 ac generator engine is equipped with an auxiliary Young horizontal-core radiator, mounted above the engine room on the main deck. This provision enables the engine to be operated in the event of a malfunctioning of the raw water cooling system. Supplying the main engines' air starting systems are two Worthington 15 hp electric compressors, rated at 49.5 cfm at 1490 rpm. A 10 hp Petter diesel engine powers either of the compressors, for use in initial starting. Located aft of the main engine room on the lower deck are the Halliburton cementing unit, reserve mud, and the cement and dry mud hoppers. Stability of the new rig during submerging and surfacing operations is controlled by the use of four pontoons, recessed in the underside of the hull, at each of its four corners. The pontoons are 50 ft long and 24 ft wide, with a depth of four feet. Hydraulic rams controlling these pontoons are housed in eight of the platform's ten supporting legs, and are actuated by the mud pumps, with drilling water used as the hydraulic medium at 1000 psi. During lowering operations, the pontoons are extended to the ocean floor, and stabilize the vessel while ballasting is being performed. Twenty ballast tanks are located in the barge's hull, with ballast level being controlled by four Fairbanks-Morse pumps.

Also located in the hull is a 51,280 gallon fuel oil tank, a 40,000 gallon portable water tank, and a drill water tank, having a capacity of 129,000 gallons. Pumps for these tanks are Fairbanks-Morse, powered by ac motors and are situated, along with ballast pumps, in a centrally-located pump room in the barge hull. The pipes leading from the storage tanks to the elevated platform are housed in one of the remaining supporting legs. The remaining leg is equipped with an elevator. The hull itself is of rectangular construction with wedges welded on both port and starboard sides. These wedges, triangular in cross-section, extend the complete length of each side, providing additional stability when under tow, and serving as protection against scouring. An anti-scouring coaming is constructed on the lower edge of both wedges, and is sub-divided into water tight compartments. Another similar wedge is located on the hull's forward end, and serves as rake when the vessel is under tow. A 32 ft-wide open-end drilling slot is located in the barge hull, and extends 37 ft inward from the stern. Nerve center of the rig during raising and lowering operations is the central control room, located forward of the main engine room on the lower deck. In this room are installed controls for all pumps and valves used in ballasting, and for extending and retracting the pontoons. The master panel housing these controllers was manufactured by McIntosh Marine Service Co.

The drilling floor of the *Jim Woodruff* is elevated above the main deck, forming the third level of the elevated platform, and is topped by a Lee C. Moore 140 ft, 4-position derrick, with a capacity of 1,100,000 pounds. The pipe storage space is located immediately forward of the drilling platform on the main deck and is serviced by a 7½ ton capacity bridge crane, having a vertical travel of 145 ft. Travel motors for the crane are 440-volt, 3-phase, 60-cycle, ac induction motors, and power for the hoist is provided by a 230 volt, dc ex-

Moored at its construction site at Bethlehem Shipbuilding Division, Beaumont, Texas, the *Jim Woodruff Barge No. 51* waits to be taken to the Sabine Pass, where final outfitting of the derrick will take place. The new Penrod Drilling Company diesel-electric barge was christened by Mrs. Dolly Woodruff.





Prime power for operating Penrod Drilling Company's newest diesel-electric drilling barge, the *Jim Woodruff Barge No. 51*, is supplied by these eight Caterpillar D397 diesel engines. Five units are equipped with General Electric 600 hp differential compound dc generators and drive the drilling equipment through electric motors. The other three engines power GE 300 kw ac synchronous generators.

plosion-proof motor. In addition to handling pipe, the crane services the platform's storage compartments and serves as a personnel elevator. Living quarters for the rig's personnel are located in the forward portion of the platform. Providing accommodations for 80 men, these facilities are built on two levels, and are completely air conditioned. The upper level of these facilities form the main deck house, the roof of which serves as a helicopter platform. Cable-mounted boat fenders, adjustable to various water levels, are situated on all sides of the drilling rig, to serve as protection for the supporting legs. Adjustment of fender height is afforded by eight Braden winches, powered by GE electric gear motors, which are mounted on the lower deck. Safety provisions aboard the *Jim Woodruff* include two 55-person lifeboats, mounted on 8 in. davits on the forward port and aft starboard corners of the rig, two fire pumps located in the main engine room, 27 portable fire extinguishers, two fixed fire extinguisher systems and 90 life jackets.

SEA GIANT AND *SEA WITCH*

By KENNETH MacDONALD

EQUIPPED with new diesels sufficient to roam the 7 seas, two identical tugs, the *Sea Witch* and the *Sea Giant*, largest ocean-going tugboats ever built on San Francisco Bay, are now in full-scale operation up and down the Pacific Coast. Prototypes of a new class of huge tugboats, the 125 ft, 9 in. *Sea Giant* and *Sea Witch* were built by Pacific Coast Engineering Co. for the Shipowners and Merchants Towboat Co., Ltd. Designed by San Francisco naval architects L. C. Norgaard and Associates, the *Sea Witch* went into service April 1 of this year, and the *Sea Giant* on May 1. Normally, according to Joe O'Leary, Port Engineer for Shipowners and Merchants, the two tugs will operate in the Pacific Coast trade, towing oil and lumber barges. Because of their power, they are capable of towing services anywhere in the world.

Both tugs were outfitted by Pacific Dry Dock and Repair Co., at Oakland and both have identical Enterprise Engine and Machinery Co. 8 cylinder, 2000 hp DMR-38 engines, 55-ton diesel plants. "The *Sea Giant*," explains O'Leary, "is probably the largest tug ever seen in these waters, whether you measure her size, her power plant, or her capabilities. She is 125 feet, nine inches in over-all length, with a beam of 28 feet and a draft of 16 feet. She's literally a 'dream' to operate," O'Leary continued, "and a pleasure to be a part of, with quarters and operating conditions comparable in many ways to those of the finest pleasure steamers." The main Enterprise engine on both tugs, installed at Pacific Dry Dock's Oakland yard with a 100 ton A-frame derrick barge owned by the Smith Rice Co., San Francisco, has a 17 in. bore and 21 in. stroke. Rated 2,000 hp at 300 rpm, the engine gains additional power from a Brown-Boveri VTR 400 turbocharger and swings a Doran propeller which is more than 9 feet in diameter and weighs 4,500 pounds.

"The fuel tanks," explains Carl Kroger who is Chief Engineer aboard the *Sea Giant* for Shipowners and Merchants, "have a capacity of 50,000 gallons, which is more than enough to run through at least 40 days of typical service between coastal ports, or for any emergency run to a distressed ship miles off shore." Both vessels boast a bluff bow that rises sharply above the water for service in any weather. And below the surface there are exceptionally fine lines for efficient cruising and towing. "The tremendous power plants," Port Engineer O'Leary points out, "will enable us to cut towing time considerably. This, in turn, of course, adds tremendously to our ability to handle more jobs and give even better service than in the past." In order that the tugs might be able to handle any towing situation that might arise, both are equipped with a Markey towing engine and double drum winch, hydraulically powered. One drum carries 2,800 feet of 1 and ¾-inch wire rope and the other 2,000 feet of two-inch wire rope. Another unique engineering feature of these tugs is skin cooling, made possible by her 880 square feet of shallow tanks formed in the engine room by inner and outer steel plating about 6 inches apart.

The big 2,000 hp turbocharged Enterprise diesel being dropped into the engine room of the *Sea Giant*. Note Manzel mechanical lubricator in foreground.

Sea Giant on her trial run in San Francisco Bay just prior to entering full-scale service early last May. Note Bay Bridge in background.

Sea Witch powered with a 2,000 hp Enterprise diesel now in active service.

George Anger, District Manager for Enterprise in San Francisco; Carl Kroger, Chief Engineer for the owners, and Naval Architect, Don Faber, for Pacific Coast Engineering Company.

Table of Equipment

Engines	2,000 hp model DMR-38, 8-cylinder Enterprise turbocharged diesel in each ship. Bore 17 in., stroke 21 in., 300 rpm.
Turbocharger	Brown Boveri
Governor	Woodward
Fuel oil filters	Purolator and Winslow
Heat exchangers	Thermxchanger
Pyrometer	Alnor
Mechanical lubricator	Manzel
Air filter	Air-Maze
Mufflers	Maxim
Lube oil filter	Cuno
Naval architect	Norgaard & Associates

cold temperatures naturally present special prob-

cooling system, with a Ross heat exchanger, is em-

covered from the solution by the ion exchange pro-

OPEN PIT MINING FOR URANIUM

NEITHER bitter cold, nor a relatively inaccessible location, nor gummy glacial silt could stop the successful development of a strategically valuable uranium deposit by Gunnar Mines Limited. The uranium ore is located in northwest Saskatchewan, less than 450 miles south of the Arctic Circle. Before production could begin, mining equipment, a diesel power plant, a 1250 ton/day ore treatment plant and a community to house 800 persons were required. Temperatures in this area range from 88°F. above zero in June to 55°F. below zero in January. The average winter temperature is minus 10°F. and the freeze-up period extends from October 25th to May 15th. The Gunnar property is located on the north shore of Lake Athabaska, 450 air miles northeast of Edmonton, Alberta and 250 miles from the northern end of the railroad at Waterways. Thus, the only access to the property is by aircraft for personnel and light freight and by barge, via the Athabaska River during the summer, for heavy equipment and bulky supplies. From discovery to the production of treated ore in 38 months, is a respectable achievement for any mineral development but the unusual conditions which complicated the development of the Gunnar Uranium Deposit make this schedule a remarkable achievement. The ore body at Gunnar resembles a massive pipe which plunges from the surface at a 45 degree angle for a known length of 1400 feet. Its diameter near the surface is about 450 feet and this upper portion will be mined by open pit. The lower portion of the pipe lies beneath Lake Athabaska and is protected from the lake by a 400′ thick sill. This ore will be removed by underground mining methods.

Development of the open pit involved the removal of 353,000 cu yds of overburden and 900,000 tons of waste rock tapping. It consisted of 2-3 ft of muskeg, 20-60′ of frozen glacial silt and huge tongues of crystal clear ice scattered throughout the overburden. As can be imagined, this material gave considerable trouble. More than 450 tons of earth-moving equipment and vital supplies were flown to the site from March to May 1954 and landed on an ice runway prepared in St. Mary's Channel. In June, the heavy equipment and bulkier supplies began to arrive by barge. That summer, 20,000 tons of freight, including 96 carloads of cement, arrived by water. Four Nordberg 1200 hp diesel engines for the power plant were among the larger items of equipment. With the arrival of this type of equipment, construction of the major buildings proceeded rapidly. The construction and operation of mine, mill and town facilities requires a considerable amount of electric power. The area does not lend itself to hydroelectric generation so Gunnar chose a diesel-electric type power plant. Five Nordberg four-cycle diesel engines are now in service and a sixth Nordberg engine is now being installed. Total plant capacity will be 5070 kw. The Supairthermal engines have six cylinders of 13″ bore and 16½″ stroke and each is rated 1200 hp at 450 rpm. They are direct connected to English Electric 2300 V, 60 cycle generators, rated 845 kw. During a recent one year period, the power plant generated 18,845,850 kwhs and consumption of fuel averaged 16.84 kwh/Imp. gal. Extremely

Valuable uranium ore is mined at this remote site in northwestern Saskatchewan by Gunnar Mines Limited. The dock facilities, open pit mine, powerhouse, mill and extensive housing facilities for both single men and families are shown in this aerial view.

cold temperatures naturally present special problems for Keith Crotean, Mechanical Supt. and Oli Kristjanson, Power House Supt. The year's supply of diesel fuel, 1,600,000 imperial gallons, is brought in by barge each summer. The tank farm is located near the docks and is 800 ft from the powerhouse. Imperial Esso fuel oil #46, which is classified as a Bunker "C" or No. 5 oil, is burned. Since it has an A.P.I. gravity of 10.1 and a pour point of 0°F., each storage tank contains a heating coil with 42 square feet of heating surface. This system is sufficient to maintain a flow of approximately 7 gpm through a 3" Viking gear type pump, even in the coldest weather (minus 55°F.).

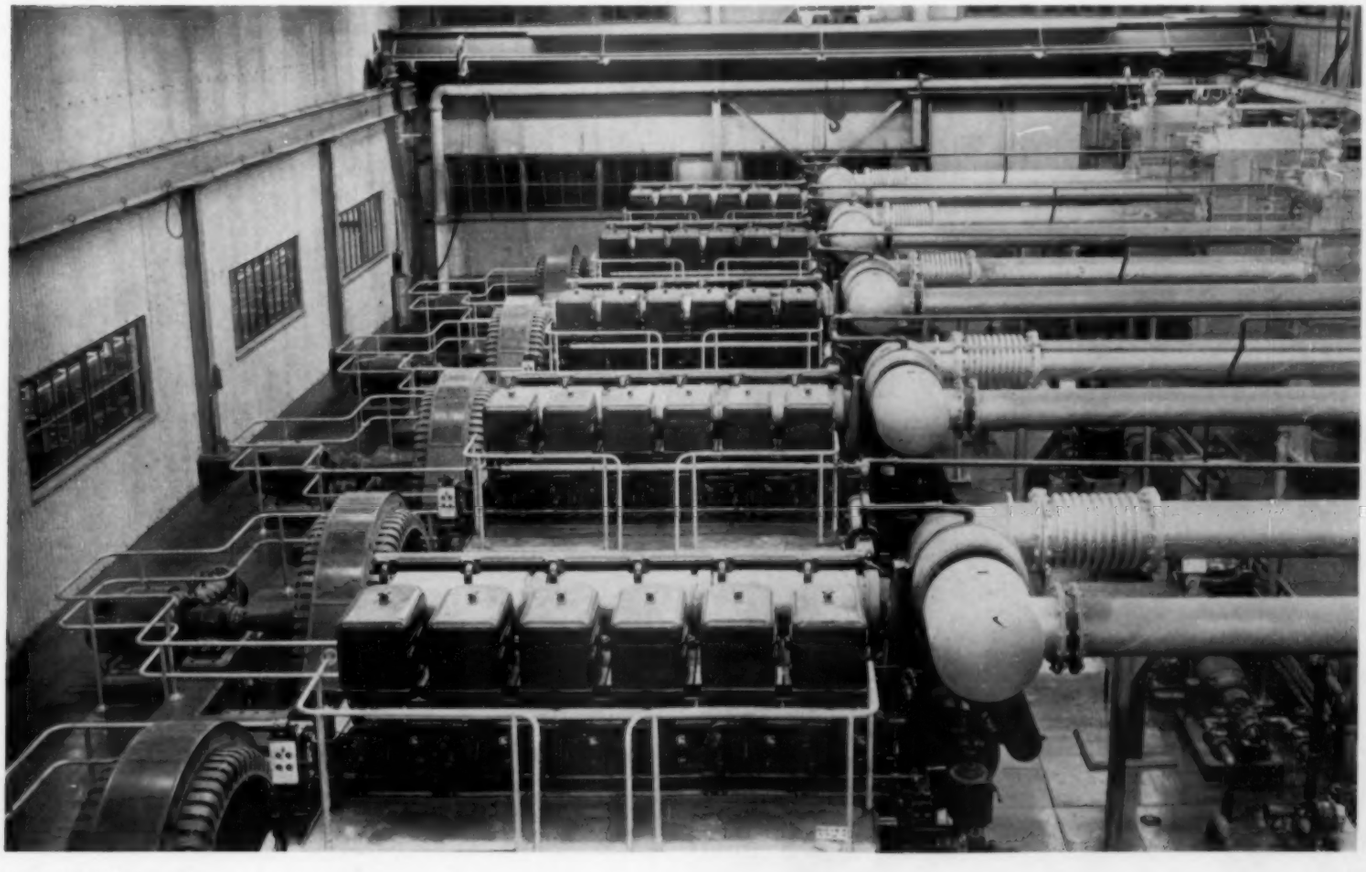
Because of the solid rock in the area, the oil lines and all other service pipes are not buried. Instead, they are encased in wooden, heated pipe boxes that are supported above the ground. The pipes are wrapped with a tough moisture resistant paper and intervening spaces in the box are packed with wood shavings. This affords good protection and seldom are any pipes frozen. At the power plant, the temperature of the oil is raised to 180°F. in two Rosenblatt, plate type heat exchangers. It is then cleaned in either of two Sharples Nozljector Recycle centrifuges and stored in five, one thousand gallon day tanks. These are lagged with one and one-half inches of magnesia block insulation and the oil retains a high percentage of its heat prior to use. Cooling water is drawn directly from Lake Athabaska to a 1000 gallon storage tank in the powerhouse. A conventional, indirect type cooling system, with a Ross heat exchanger, is employed. A Zeolight water softener is used to supply make-up water for the engine jackets. Barrels of lubricating oil are brought in each summer by barge and are stored in the warehouse yard, from where distribution is made as required. Nearly 10,000 gallons were consumed during 1956. The exhaust gas from the Nordberg diesel engines is utilized in two ways. It is initially passed through Foster-Wheeler waste heat boilers and produces 3000 lbs of 50 psig saturated steam per hour per engine at full load. The gas then passes up the exhaust pipe which is surrounded by the scavenging air intake pipe. In this way a reasonably constant air intake temperature is maintained. The steam which is produced is used in heating the many plant and camp buildings. All buildings are of modern construction and are supplied with chlorinated water, electricity and steam heat. A considerable quantity of steam is also produced in the acid plant, which produces 100 tons of 100% sulphuric acid each 24 hours.

Current tonnage from the open pit is about 35,000 tons of waste and 11,000 tons of ore per week. The ore is reduced in three crushing stages by Nordberg built Symons Crushers to minus ⅝" size. The mill has two identical sections, each with a capacity of 850 tons daily. Crushed ore is further reduced in two grinding stages and is thickened to 57% solids prior to leaching. Sulphuric acid is introduced into the primary agitator and sodium chlorate into the secondary agitator. The uranium is then recovered from the solution by the ion exchange process, followed by precipitation with magnesia. After filtering, washing and drying, the yellow powdered uranium oxide is packed in steel drums for air shipment. A 5600' airstrip was hacked out of the bush and a company owned plane maintains a regular schedule between Edmonton and the Gunnar airstrip. The Gunnar uranium deposit now has an estimated value in excess of $130,000,000. The planned facilities were completed in little more than three years from the date of discovery at a cost of $20,000,000, the original estimate. Today, Gunnar Mines Ltd. is one of the largest producers of uranium in Canada. Thanks are due to J. N. Botsford, Mine Manager, for his assistance in the preparation of this article.

PRINCIPAL AUXILIARY EQUIPMENT

Generators	English Electric
Governors	Woodward
Turbochargers	DeLaval Steam Turbine
Fuel filters	Winslow
Fuel oil heaters	Ross
Fuel injection pumps	Scintilla
Lube purifiers	Winslow
Lube oil pumps	Roper
Lube coolers	Ross
Intake air filters	American Air
Air compressors	Quincy
Air intercoolers	Young Radiator
Pyrometer	Alnor
Alarm system	Viking Instruments

Five Nordberg diesel engine-generator units provide the electric power at Gunnar. Foster-Wheeler waste heat boilers (upper right) utilize the exhaust gas from the engines to produce low pressure steam. The sixth Supairthermal engine is being installed, raising plant capacity to 5070 kw.



FIGHTING DROUGHT WITH IRRIGATION

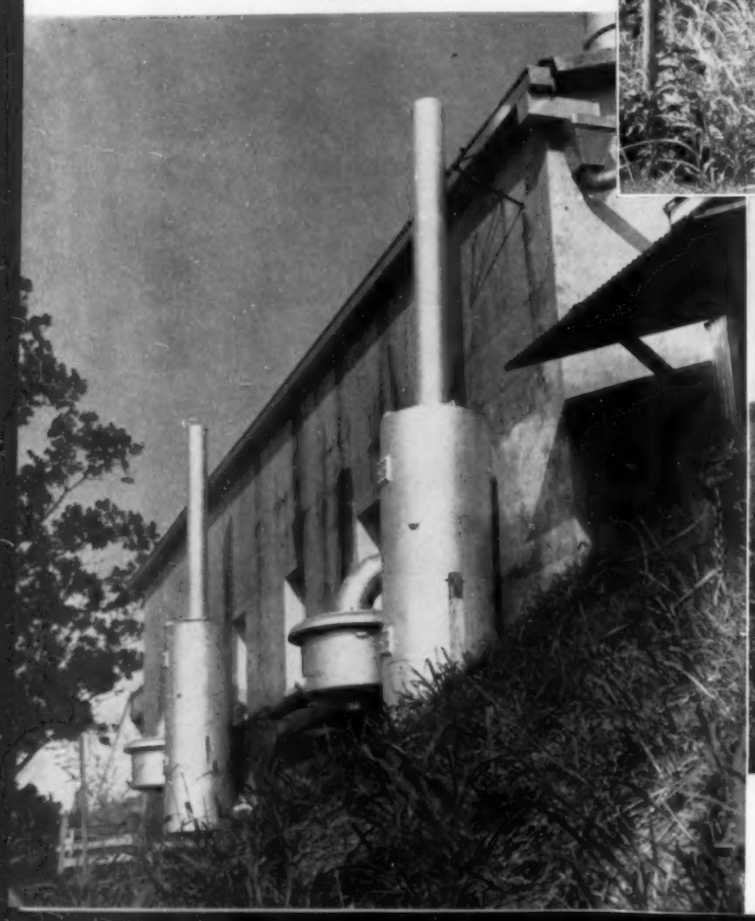
THE Pierce Ranch near Wharton, Texas, irrigated nearly 22,500 acres of land in 1956 which was one of the worst drought years in the history of the Lone Star State. To do this required 50,000 acre-feet of water, a total of 18 billion gallons. It was not only the one Texas ranch west of the Colorado River with enough water for rice, which requires from three to five acre-feet of water per season, but was actually able to increase rice production. Prior to 1956, the pumping system supplied only enough water for 4437 acres of rice. With the new equipment in operation, an additional 600 acres have been put in rice and 17,443 acres of pasture land, corn, cotton, grain and fodder are irrigated. According to Ranch Manager Max Rotholz, the total cost of irrigation is only a quarter of what it formerly was and productivity of the ranch has been increased 30 percent.

These remarkable improvements have been brought about by changing from steam-powered pumps to a pair of efficient modern pumps driven by two Fairbanks-Morse 5-cylinder 800-hp, model 38DS8-1/8 spark-ignition gas-fueled opposed-piston engines. The engines drive 36 in. Fairbanks-Morse angle-flow pumps which deliver 57,000 gpm each at 21 ft total head. These pumps supply the ranch's 25-mile system of main canals which feed the laterals and trenches. Although the reduced cost of pumping is a considerable item, the increased income from crops and beef due to expanded irrigation is even more important. Last year the ranch had all the water needed though none to waste. Ample water is essential to rice which brings in more money per acre than any other crop. The average yield is 21 bu per acre and it brings about $170.00. Cotton is an alternative but the income per acre from cotton is only $150.00. By planting another 600 acres in rice instead of cotton, the crop income on just 600 acres is increased $12,000.00 per year. Ample irrigation of pasture lands is of great importance since the Pierce Ranch runs 5000 head of fullblooded Brahmans and drought could half starve or kill the valuable cattle. To provide them with irrigated pastures and still spend substantially less money for pumping than it cost before modernization of the pumping facilities is a major achievement. Books and stories have been written about the ranch and its founder, Abel Pierce, a slender six-foot-four Rhode Islander who turned cowboy and, without money, entered the cattle business at the age of 46. In less than 20 years he became a cattle king with a domain of about half a million acres. The present 32,000-acre Pierce Ranch is owned by a granddaughter, Mrs. Lacey Withers Armour of Chicago who, with her son, Lawrence Armour, Jr., is a frequent visitor, for in addition to its old home appeal it is a big business to be supervised. The ranch is managed the year around by Max Rotholz, who is a Texas A & M graduate.

The first Brahman cattle brought to this country for commercial use were imported by the Pierce Ranch in 1904. The present herd of 5000 is one of only ten herds of fullblood Brahmans in the United States.

The new Fairbanks-Morse engine and pump installation occupies the former pump pit in the original building on the bank of the Colorado river which is also the boundary line of the ranch. The boilers were originally on the upper level at river bank height. Their tubes are now fence posts. The river has a normal depth of 0.87 ft and fluctuates upward to as much as 21 ft. To place the original pumps near the normal river level, a pit was constructed with heavy steel-reinforced concrete walls, one of which holds back the river at flood stage. The original building was well constructed with a gantry crane of 10 tons capacity above the pump pit. A brush with a

The photographer perched on the river bank to show the rear of the pump house with the Maxim exhaust silencers and American Cycoil air filters.



A field of corn like this would indicate a major crop on most farms but it is just a small element of the Pierce operation. The fields are irrigated.

tornado a while back left the building intact though minus a smokestack. There was ample room in the original pump pit for installation of the Fairbanks-Morse pumping units on new concrete foundations. The 5-cylinder opposed-piston engines deliver 800 hp each at 720 rpm. The 57,000 gpm F-M angle-flow centrifugal pumps are driven at 250 rpm through Lufkin reduction gears with an Airflex coupling between engine and gear and a Thomas flexible coupling between gear and pump. The wet field gas used for fuel is put through a scrubber on the river bank. Air inlet filters and silencers are attached to the building on the river side above flood level. The engines are cooled by a closed jacket cooling system with treated water to prevent scale. There is, of course, an ample supply of raw water. Heat exchangers for oil and jacket water are banked along the rear wall of the building. Near these, there are two three-unit Fairbanks-Morse lube oil filters. In one corner of the engineroom are three starting air tanks and a small motor-driven compressor to keep up the pressure.

Since the engines are equipped with attached water and lube oil pumps, they are self contained units independent of separately-driven auxiliaries. In order to prime the irrigation pumps when necessary, there is a vacuum pump driven by a 4-cylinder gasoline engine. The irrigation pump discharge lines, 3 ft in diameter, rise straight out of the pumps and make a right angle turn leading directly to the spill valves at the head of the canal. These are non-return valves with hinged closures to prevent backflow when one pump is shut down and the other is running and maintaining flow level in the canal. The pump suction is taken from a pool in the river bottom. During flood stage, gravel banks sometimes build up and shut out the pool. To correct this situation, a scoop and double drum winch driven by a gasoline motor are used. One cable on the drum is a haul back and the other is a drag line. By this arrangement the channel to the pool can be reopened to carry river water to the pump suctions. Whereas the old steam plant required a crew of 13 men, the present operating force is four. There are three shifts with one man on a shift and one for relief during weekends and holidays. The present operating staff was selected from the men in the steam plant for their apparent aptitude and ability. To date, the engines have worked flawlessly. To insure continued trouble-free operation, a preventive maintenance schedule has been set up, including complete inspection and servicing once a year. The new plant started full operation in April and worked a heavy schedule through Spring and Summer and into the Fall, providing water for irrigation at exceedingly low cost. In the peak months of July and August, the two engines operated continuously on a round-the-clock basis, rolling up 2,966 engine-hours out of a possible 2,976. By the end of December, the two units had run 8,077 engine-hours. During that period, the big F-M pumps supplied water for 38,743.9 acre-months of irrigation. The largest volume of water went for 21,609 acre-months of intensive irrigation for the 5,000 acres of rice, with the rest going for pasture, cotton and corn. In all, more than 18 billion gallons were pumped.

Pumping costs were a revelation to Pierce management. Total plant operating cost averaged $1.87 per engine-hour, actually only 39 cents per acre for each month it was irrigated. Included in this total operating cost of $15,104 was fuel, lubricating oil, labor, supervision, maintenance, supplies and electricity.

Itemized costs for the period were:

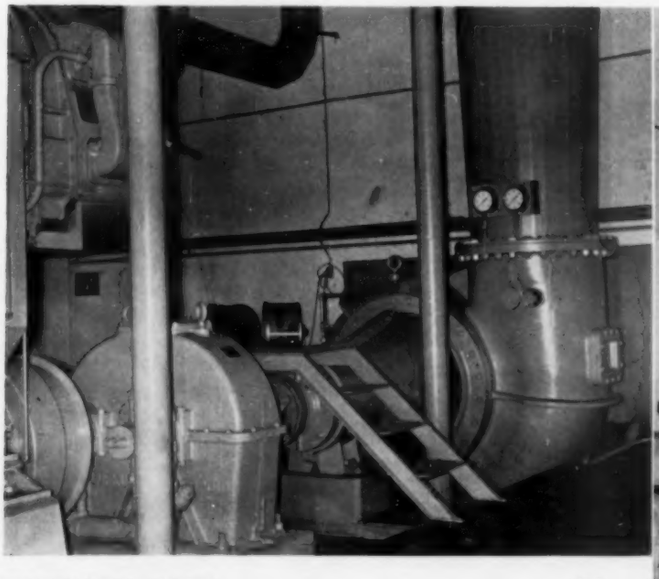
Fuel gas	$ 4,843.
Labor	6,196.
Supervision	1,377.
Lube oil	969.
Maintenance	902.
Supplies	196.
Electricity	322.
Misc.	299.
Total	$15,104.

This cost figure is only a fourth the amount spent for a lesser volume of pumping with the old steam plant, an indicated saving of more than $45,000. for this 9-month period. The explanation can be found in a sharp reduction in manpower requirements, greater pump efficiency, and more efficient utilization of fuel. The new installation of Fairbanks-Morse engines and pumps on the Pierce Ranch is another of the many major improvements which have been made down through the years, including the introduction of Brahmans, the initial decision to irrigate, the subsequent improvement of the irrigation system, the growing of rice and crop diversification which is now looked upon as one of the chief reasons for profitable operation every year during the past 15 years. Ranch management involves some factors beyond man's control, but Pierce Ranch has improved its control over crop water supply, helping to insure continued profit in the years ahead.

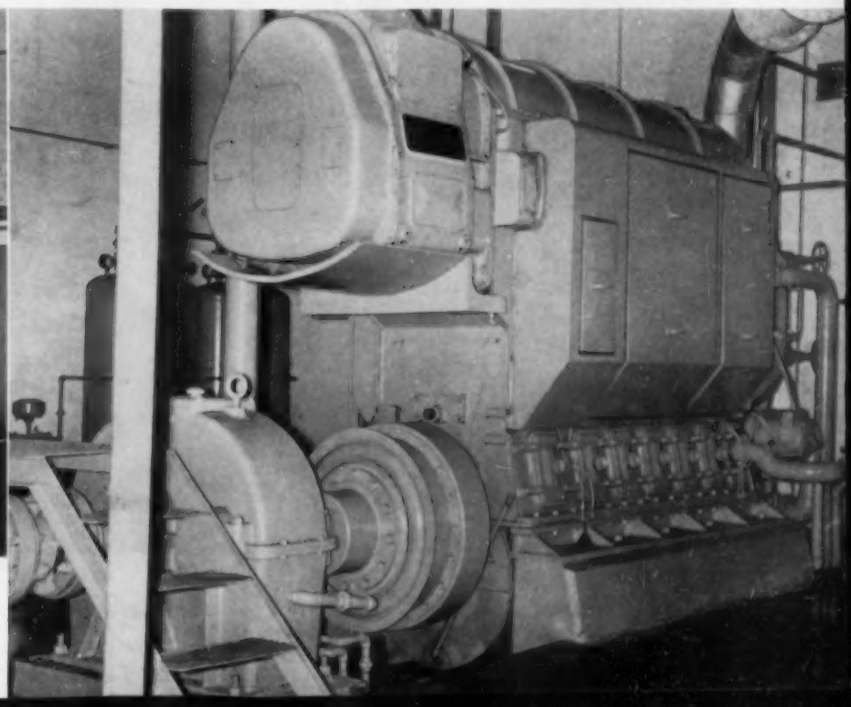
Equipment List

Engines	Fairbanks, Morse (2) 5-cylinder, model 38DS 8-1/8, 800 hp, 720 rpm, opposed-piston diesels
Pumps	Fairbanks, Morse (2) 36-inch, angle-flow centrifugal pumps, each rated 57,000 gpm, at a 21 ft total head
Couplings	Airflex (2) Between engines and gears. Thomas Flexible Coupling Co. (2) Flexible couplings between gears and pumps
Gas engine driving vacuum pump	International Harvester
Reduction gears	Lufkin Foundry
Exhaust silencers	Maxim
Air Filters	American Air Filter
Pyrometers	Alnor
Heat exchangers	Ross
Lube oil coolers	Ross

The F-M engines drive the big Fairbanks-Morse angle-flow pumps through Lufkin reduction gears with Airflex and Thomas couplings. The pumps take Colorado River water and pump it up to the main canal for gravity flow through the system.



This is one of the two Fairbanks-Morse opposed-piston spark-ignition natural gas engines that drive the Pierce Ranch irrigation pumps. Each engine is rated at 800-hp at 720 rpm.

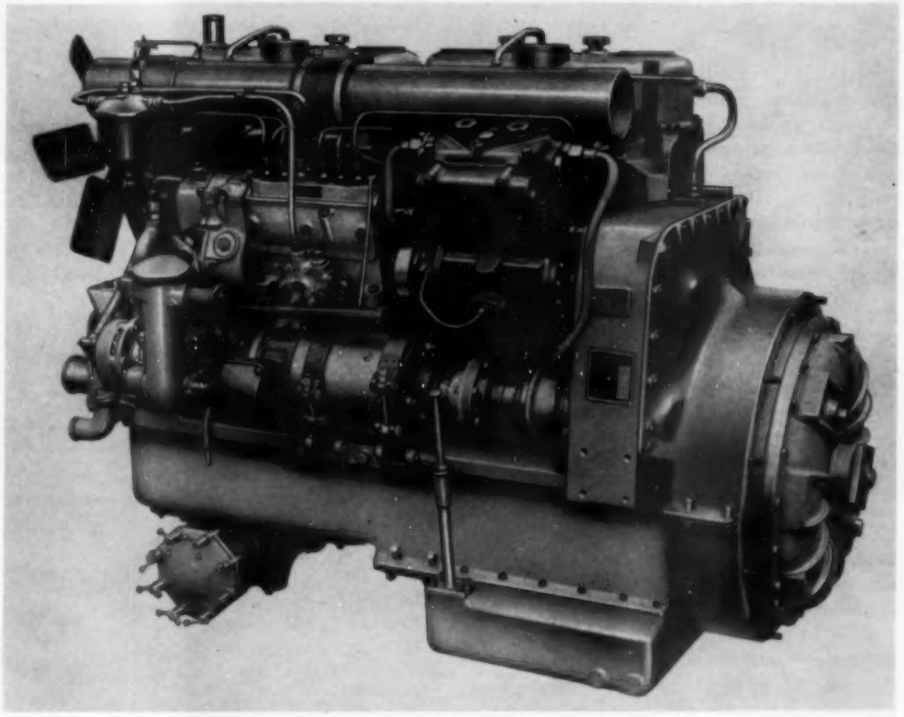


BRITISH DAIMLER DIESELS FOR U.S.

NEWS that the British Daimler Company is now able to supply to the United States Market diesel engines as separate units—separate, that is, from their own complete vehicles—is of more than passing interest. Nearly 60 years ago the Daimler Company of Coventry, centre of the British motor industry, built the first English automobile, and since that time the name "Daimler" has become an accepted symbol of quality, luxury and reliability, representing all that is best in the British tradition of engineering craftsmanship. It is well enough known that most of the cars used by Her Majesty Queen Elizabeth II and other members of the Royal Family are Daimlers, and in this there has been continuity since the first Royal Warrant was granted to the company by King Edward VII. Less well known outside Britain is the fact that Daimlers have an equally long tradition of experience and service in the commercial vehicle field, having built their first buses (petrol engined then, of course) as far back as 1910.

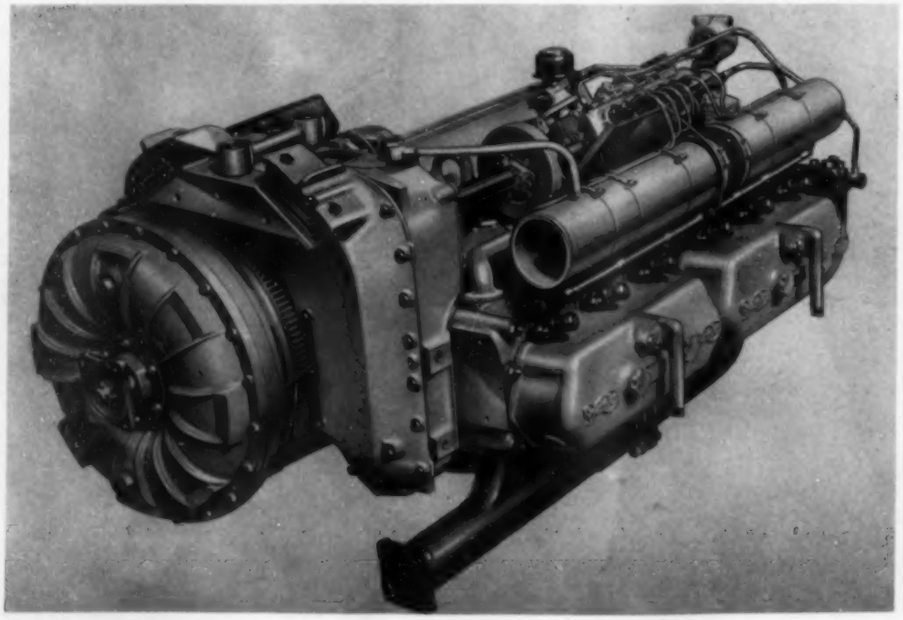
Tradition and enterprise have continued together, and a few years before the outbreak of World War II work on the development of Daimler diesel engines was well advanced. This development was halted violently and abruptly soon after the war began, when some of the prototype engines and designs were destroyed in the blitz which wrecked pretty well all of the industrial heart of Coventry except its indomitable spirit and the technical "know how" of its people. In 1945 the first Daimler diesel—a 125 bhp 6-cylinder 8.6 litre engine, developing maximum power at 2,000 rpm—was available for Daimler bus chassis. This new engine was a success, and thousands were made to meet the demand. There followed soon afterwards a larger, higher powered 150 bhp 10.6 litre engine in both vertical and horizontal form, and this was received as enthusiastically as was the original diesel engine.

Until recently Daimler's own consumption of these engines for their own chassis and for their own agents meant that of necessity a deaf ear had to be turned to other demands. A new scheme of factory reorganization, a production re-planning, however, now makes it possible for a number of these well-tried heavy duty diesels to be made available for overseas use, particularly in the United States. This increase in output and greater availability comes at a time when another addition to the Daimler diesel range makes its appearance. This is an extremely tough and powerful 170 bhp 6-cylinder 11.6 litre industrial engine, developing maximum power at 2,000 rpm and designed primarily for earth moving equipment. Daimler buses fitted with the company's own diesels are operating in 15 different countries in all parts of the world and in climatic conditions ranging from the heat of South Africa to extremely low temperatures in Norway—this in addition to the large number of buses in service over the whole of the British Isles.



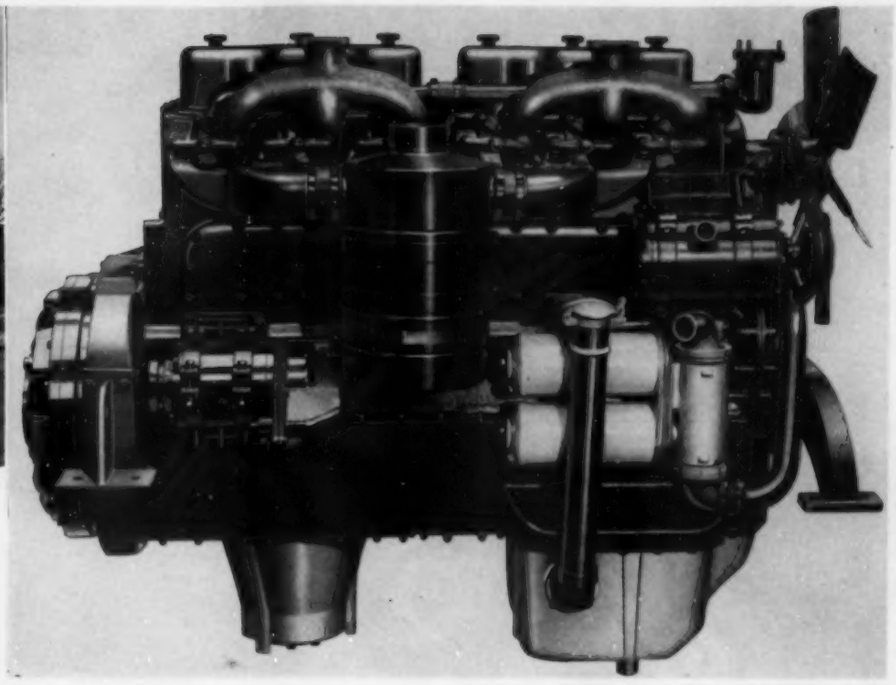
Daimler diesel engines CD.650 vertical, 6 cylinders, 5 in. bore, 5½ in. stroke, capacity 10.6 litres (648 cu ins.) Maximum power 150 bhp at 2000 rpm.

Daimler diesel engines CD.650 H. Horizontal, 6 cylinders, 5 in. bore, 5½ in. stroke, Capacity 10.6 litres (648 cu ins.) maximum power 150 bhp at 2000 rpm.



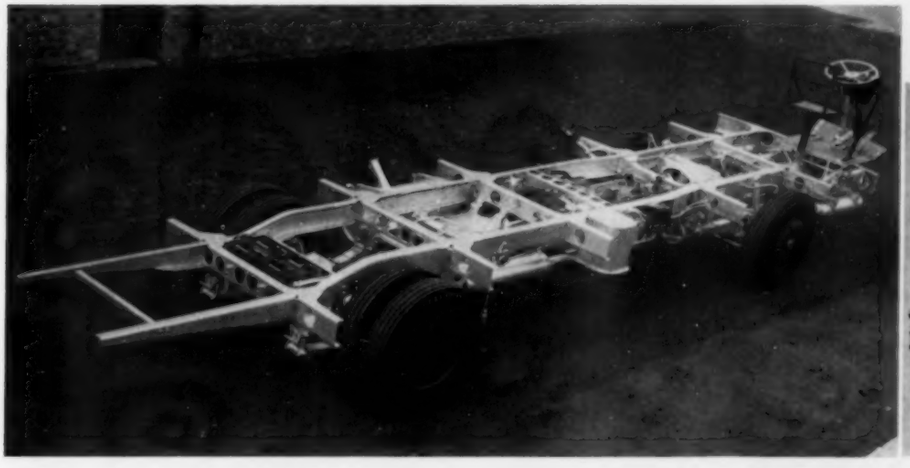
Already some of the engines that have become available have been sent to Belgium for use in lorries and rear-engined chassis of Belgian make, while in England the Mathway Marine Company has chosen Daimler diesels to power their new boats. Ample evidence that the engines have been well and truly tested under the most arduous of operating conditions is provided by reports from users. For example, the transport undertaking at the British seaside resort of Southend records that after eight years of service and 302,000 miles of

Birmingham—second largest city in Great Britain operates over 1,000 Daimler buses.

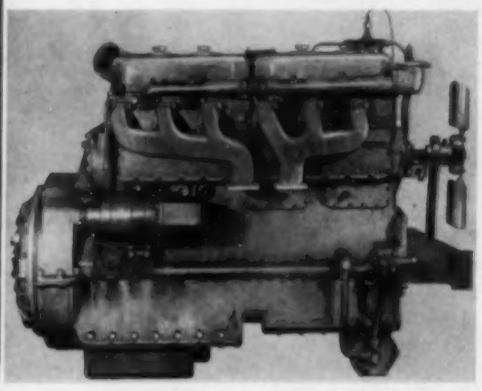


Daimler diesel engines TD 6/700 vertical, 6 cylinders, 5 in. bore, 6 in. stroke, capacity 11.6 litres (707 cu ins.) maximum power 170 bhp at 2000 rpm.

Daimler "Freeline" chassis with horizontal under floor engine.

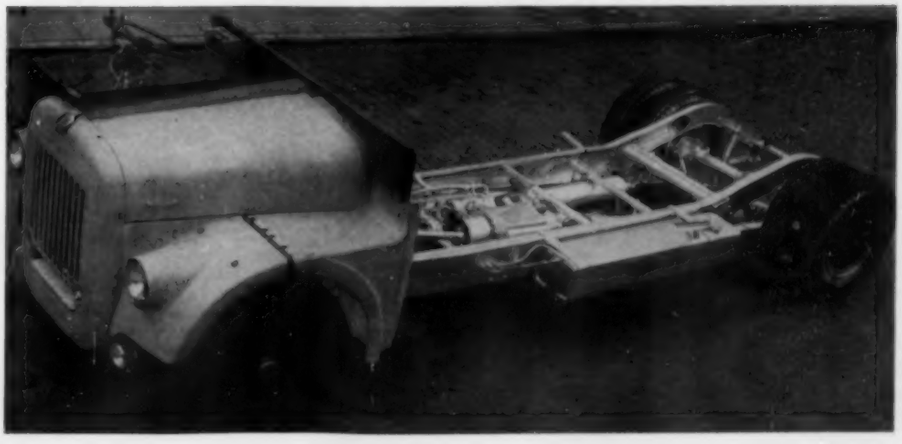


Daimler diesel engines CD6 Mk.VII vertical, 6 cylinders, 4½ in. bore, 5½ in stroke, capacity 8.6 litres (525 cu ins.), maximum power 125 bhp at 2000 rpm.



gruelling "stop and start" driving a Daimler 125 bhp 8.6 litre engine in one of their buses had only 3⅔ thou. cylinder bore wear. Crankshaft bearings and pistons were in excellent condition, the only replacement made during the eight years being three sets of piston rings. Other reports have come from South American operators using 150 bhp 10.6 litre engines. One Argentinian user says that both his buses passed the 262,500 miles mark without being touched, and another declares that his seven buses each logged more than 250,000 miles without being taken out of service, and not one was losing oil. Daimlers supply their own well-proved fluid flywheel with most of their engines, but they also fit a centrifugal type friction clutch as well as the usual dry plate type. The fluid flywheel is used in conjunction with a pre-selector epicyclic, semi-automatic or fully automatic gearbox, while the dry plate clutch is used with a synchromesh box.

Daimler C.V.G.6 chassis with fibreglass front end.



NEBRASKA TEST FIELD DAY

By F. HAL HIGGINS

Diesels in the Nebraska Test on the circular track where their power is measured before a test report is made up and published. Note Cat D9, International TD24, Cat D8 and Oliver 88 and Massey-Harris diesels in the chain of tractors in this line-up.

PUBLIC interest in the famed Nebraska Test is world wide and growing year by year. To meet this demand of farmers, engineers, government officials and general public for a look at the testing equipment in action, a Tractor Field Day was recently held on the testing grounds and in the laboratories of the University of Nebraska where the famous test law of the Nebraska legislature started the testing of all farm tractors to be offered for sale in that state in 1920. That was 37 years ago and a lot of tractors have gone through the tests there since that first one. Many early tractors were weeded out by the test and never got into production with sale and service records. Several little testing laboratories and plans were going at the time the Nebraska law was passed to correct abuses encountered by a farmer who had bought a "lemon" and then got himself elected to the State Legislature. There he put into action his thought that "there ought to be a law".

The writer couldn't get over to Lincoln for the Tractor Power and Safety Day doings, but he has been at the U of N. building and in close touch with engineers in charge of the tests over the past 30 years. Times and tests have changed with the demands of tractor users and builders and the increased number of tractors sent for testing from both domestic and foreign manufacturers. The world of government, agriculture, logging, dirt moving and lesser fields now pretty well recognizes the place of the tractor in saving time and labor to lift a nation's standard of living. Hence, the importance of the Nebraska Test in eliminating inefficient machines and insuring the buyer of power as rated in advertising and sales talks. In fact, there are few other items on the buyer's list of demands in farming and industry he can be so sure of getting what he wants in power as he finds in tractors. He can order them over the telephone without a look! The program for Tractor Power and Safety Day covered foreign tractors, the new Ford "Typhoon" experimental model, a parade of the new wheel type tractors recently put through the tests, demonstrations of how the big diesel crawlers are given their drawbar tests, demonstrations of the dangers that have brought so many accidents and deaths to tractor operators, etc.

The first demonstration that opened the long day demonstrated effect of wheel weights on drawbar pull and slippage. In the demonstration of foreign tractors, Russian crawler, the French Someca diesel, the German Unimog 30 diesel, and the Lanz diesel from Germany that was recently acquired by Deere & Co., were seen.

The International crawlers of TD6, TD9 and TD18 in diesel power as well as the T6 with gasoline engine were shown from the list of tractors recently tested. The Eimco with GM engine, and the John Deere 420C were also seen in the lineup of recent tests. The experimental Ford "Typhoon" tractor was seen at both morning and afternoon sessions. Engineers from the Ford factory were on hand to explain its design and operation. In the parade of wheel types recently tested at Nebraska, we saw Massey-Harris 50 and 333 gas models; Ferguson 40; International Harvester Co.'s gasoline, LP gas and diesel models in Farmalls 130, and 230, 350 and 450. International's Utility and 650 models were here in all three fuels in the Utility model. Also in both gas and diesel in the 650. Allis-Chalmers, Minneapolis-Moline, Ford and Case were represented by gasoline models, with Case having its 301 diesel.

Safety in refueling tractors was demonstrated with the proper equipment to insure against accidents that have been so prevelant among careless and ignorant workers. Engine oils were also demonstrated with pointers for the buyers and users. The demonstration of the Nebraska equipment for drawbar tests, of course, was the high spot of the day's events. To watch the train of big diesel crawlers hitched to the dynamometer car moving around the test track was a sight never to be forgotten. There were tractors being tested that retail at $52,000 each that have proved so successful

International Diesel tractors have always been powered by engines of their own development. Here is IHC's "Big Red" TD24 on test number.

Over the past 37 years of the Nebraska Test, rules and tests have changed with the times and demands of tractor users and builders. Here is the outdoor testing course for drawbar power as it is today.

in road and dam construction that many contractors own and operate as many as 20 to 40 of them. And still bigger tractors are on the drafting boards, and in the plans of engineering staffs of the big crawler manufacturers.

Maintenance is a big factor in the life and efficiency of farm tractors. The afternoon program gave a demonstration of PTO horsepower tests as a guide to maintenance. New ideas in farm machinery was another high spot in the day. "Till-planter," plow-planter, picker attachment for combined harvester platforms for corn harvest by the small grain machines, and pneumatic equipment for metering seed and fertilizer from the same machine were four that were given attention. The old timers at the Nebraska affair gave both chuckles and a nostalgic tear or so as the old time pioneer steam and gas tractors paraded. Led by a Case steam traction engine of about the "Gay '90's" era, they saw a Froelich that was a root for the modern Deere tractor, a Townsend that came out of Jenesville, Wis., before World War I, A Hart-Parr that was a product of the Iowa factory that covered many years from around 1902 to the merger with Oliver in the high post-war boom of the late 1920's. There was also a Fordson to remind one that this name was given the auto magnate's tractor when some smart promoters in Minneapolis got hold of a fellow named Ford in their town and appeared with a "Ford tractor". It was the sale of one of these Minneapolis "Fords" to a Nebraska farmer that brought the Nebraska law when the farmer got elected to the State Legislature.

Test Number 529—An International TD24.

Putting the big one through gets to be a bigger job each year as more and bigger crawler diesels come along. Here is International's TD24 on Test Number 447.

FREE-PISTON-GAS-TURBINE SUCCESSFUL IN SEA TRIALS

By REX W. WADMAN

PIER 62, NORTH RIVER, SEPT. 18. Some 250 of the key men in the marine industry in these United States, plus a sprinkling of interested engineers from the Legations in Washington, plus a strong representation from the Press, came aboard here at the foot of 22nd Street in this City of New York this morning and we started out on one of the most interesting and pleasant trial trips it has been my pleasure to attend in many a long year. The occasion was the opportunity this trip gave all of us of seeing the gas turbine ship, *William Patterson,* which last week successfully passed her sea trials and will now be operated in trans-Atlantic service for our Government by Lykes Bros. Steamship Company. This ship is the first in the United States and the largest of its type in the world to be powered with free-piston-gas-turbine engines; hence, the keen interest of the 250 Big Shots who spent the entire day on this fine ship and I would say were as much impressed as I was with the smooth operation, excellent control and the many other things which are necessary to make an engine room aboard a big ship like this satisfactory.

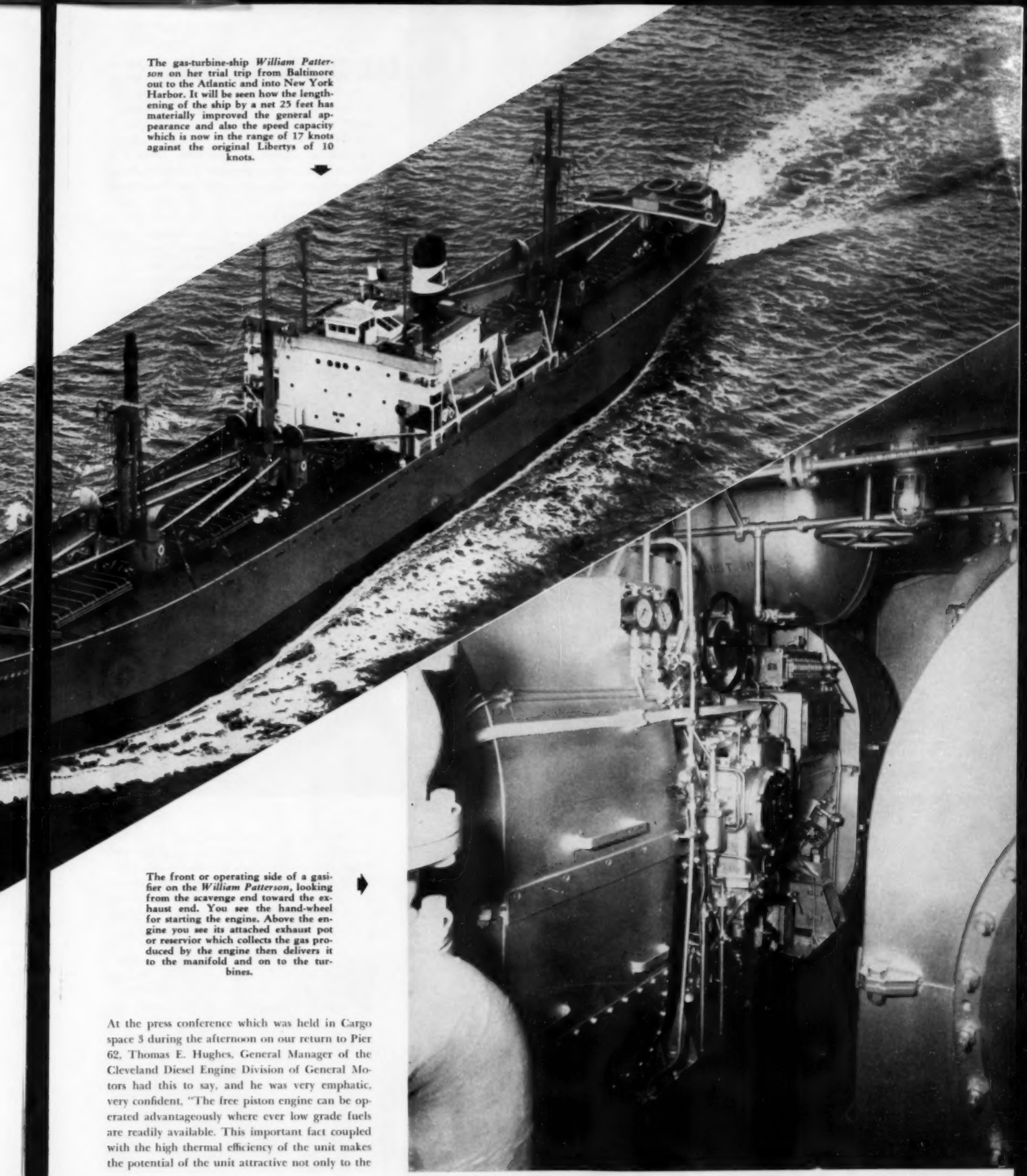
Back in the June issue of this year, I ran an article on the General Motors model GM-14 Gasifiers, six of which are aboard the gas-turbine-ship *William Patterson.* Those of you who have a file of this magazine of ours and will turn to pages 21, 22 and 23 of that June issue of this year, will find a detailed explanation, fully illustrated, of how this unique free-piston engine works, so I won't take space here to repeat that information because I have a lot of other things I want to tell you about this ship and about this first-of-its-kind marine application of a free-piston-engine.

The gas-turbine ship *William Patterson* is a converted Liberty Ship. The Bethlehem Steel Company Shipbuilding Division in Baltimore, were under contract with the Office of Ship Repair and Construction, Maritime Commission, U. S. Department of Commerce to make a change in the power plant by taking out the old steam machinery, lengthening the bow by some 25 ft and installing this General Motors 6000 shp free-piston-gas-turbine installation. This makes the fourth of the conversions started by the Maritime Administration some three years ago. Conversion of the gas-turbine ship *William Patterson* commenced September 22, 1954, with the award of a contract to J. J. Henry Co., Inc. of New York for the development and preparation of contract plans and specifications covering the project. Award for free-piston-gas turbine propulsion plant was made October 6, 1954 to the Cleveland Diesel Engine Division of General Motors at the contract price of $1,228,723. A contract was awarded to the Bethlehem Steel Company, Shipbuilding Division, Baltimore Yard, on August 9, 1955, for the completion of the conversion at a contract price of $1,857,999. Costs of reactivating the vessel from reserve status were $222,000. The ship arrived in Baltimore on September 18, 1955. Fabrication and extensive shop testing of the free-piston-gas-generator units took place at the Cleveland plant. These included a 500-hour reliability test using Bunker C. fuel.

I might state here that the sea trials of the gas turbine ship *William Patterson* produced a speed of 16.8 knots and there doesn't seem to be any doubt amongst the crew that a 17 knot average speed will be well within the bounds of practicability when the ship goes into service within the next few days. During the day here aboard ship many questions were shot at the Top Brass of the Maritime Administration, who were with us, as to why, after selecting a 6000 shp new steam turbine for the SS *Benjamin Chew* and Baldwin-Lima-Hamilton standard type of geared diesel engines for the M/V *Thomas Nelson* and an open-cycle gas turbine for the gas turbine ship *John Sergeant* they turned to the free-piston-gas-turbine for the fourth ship, and their answer is as follows: "The Maritime Administration's decision to experiment with the installation of a free-piston-gas-turbine was made after it was determined that the proposal by General Motors' Cleveland Diesel Engine Division offered exceptional possibilities for future ship power plant applications. Various powers can be obtained with the required number of standard size gas generators and different size turbine units. It was determined that the free piston engine has potential in mobilization planning since it requires a minimum of critical materials due to the fact that it operates at relatively low temperatures. It is possible also to adapt the manufacture of this unit to mass production techniques. Studies made to date indicate that the overall thermal efficiency of the free piston engine promises to be high."

Chairman Clarence G. Morse of the Federal Maritime Board and Maritime Administrator, U. S. Department of Commerce, went on to say, commenting on the demonstration run of the ship today, "The gas-turbine-ship *William Patterson* is an example of the type of 'dynamic research' now being conducted by the Maritime Administration. In our Liberty Ship experimental program we are enlisting the services of the major shipyards, naval architects and marine engineers, together with other American industries, some of which have not hitherto put their efforts into maritime equipment or adaptations. The program is providing valuable data concerning new propulsion machinery, new cargo handling gear and techniques, and for ship design and mobilization planning. We furthermore feel it is a relatively inexpensive program and is an appropriate enterprise of the Federal Government in this field. The Cleveland Diesel Engine Division of General Motors and Bethlehem Steel's Baltimore Yard are to be congratulated on the part they have played in putting the

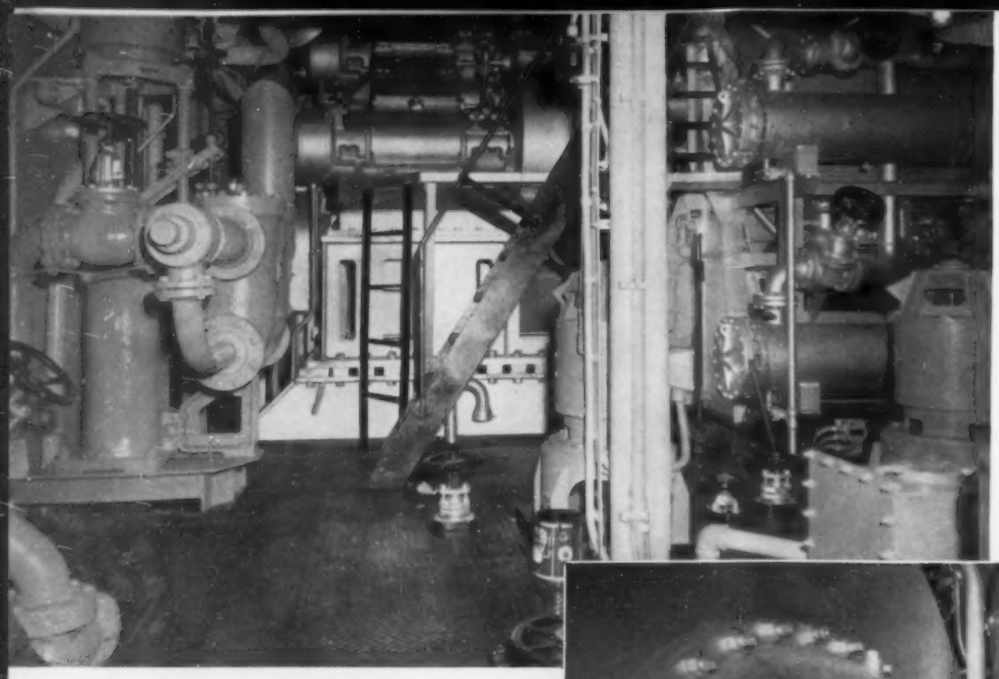
William Patterson on the seas. We have, in addition, assigned the operation of the ship to one of the most efficient American lines, Lykes Bros. Steamship Company, and I know the *Patterson* will begin her new life of service in the best of hands."



The gas-turbine-ship *William Patterson* on her trial trip from Baltimore out to the Atlantic and into New York Harbor. It will be seen how the lengthening of the ship by a net 25 feet has materially improved the general appearance and also the speed capacity which is now in the range of 17 knots against the original Libertys of 10 knots.

The front or operating side of a gasifier on the *William Patterson*, looking from the scavenge end toward the exhaust end. You see the hand-wheel for starting the engine. Above the engine you see its attached exhaust pot or reservior which collects the gas produced by the engine then delivers it to the manifold and on to the turbines.

At the press conference which was held in Cargo space 3 during the afternoon on our return to Pier 62, Thomas E. Hughes, General Manager of the Cleveland Diesel Engine Division of General Motors had this to say, and he was very emphatic, very confident, "The free piston engine can be operated advantageously where ever low grade fuels are readily available. This important fact coupled with the high thermal efficiency of the unit makes the potential of the unit attractive not only to the

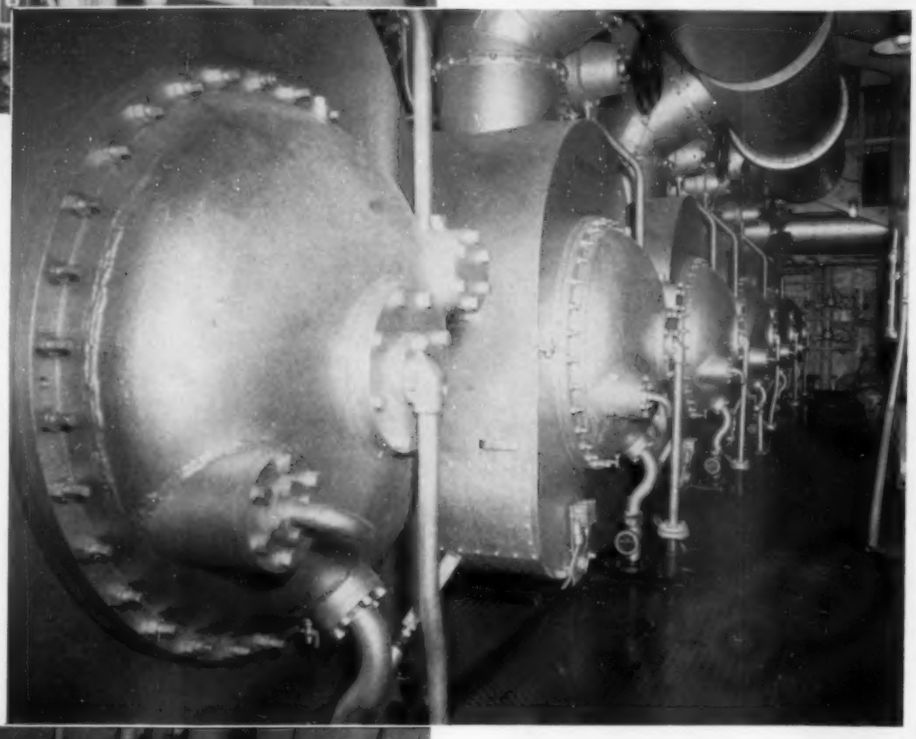


Here you see some of the many Ross heat exchangers aboard the *William Patterson*.

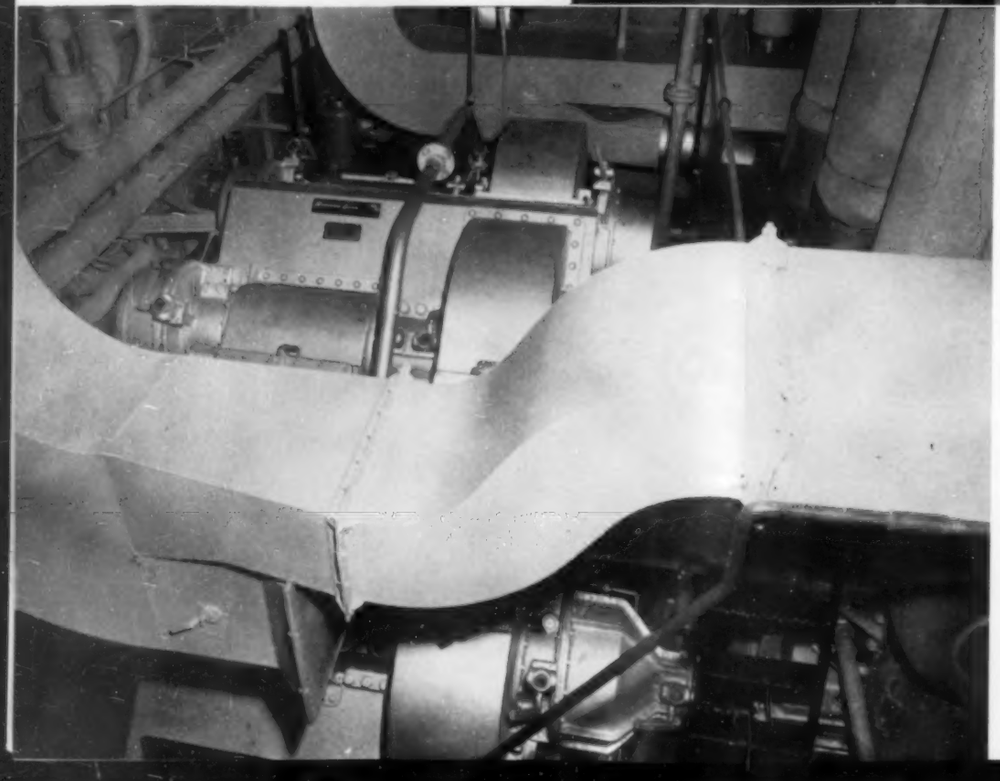
marine field, but also to the petroleum, chemical and general industrial fields where prime mover power is so important." Each gasifier in the installation delivers 1233 gas hp at thermal efficiency of 41%. The turbine efficiency is 85% overall, and the piping losses are computed at 1½ to 2%, with reduction gear loses at 3% on actual test.

All in all, a very successful trip and I appreciate the courtesies extended to me by the Cleveland Diesel Engine Division of General Motors and to the Maritime Administration for inviting me to come from Los Angeles to New York to see this, the latest development in marine power plants. I might add that down in the engine room some of our old friends are well represented. The heat exchangers, oil coolers, etc., are Ross. There is a Marquette over-speed governor located where it will do its job of stopping a runaway should such a thing happen. Large Cuno fuel filters are mounted back of the Sharples fuel centrifuges and Briggs lube oil filters are mounted back of the Sharples lube oil centrifuge. Shell supplies the lube oil for piston cooling and turbine shaft lubrication and Shell also supplies a special free-piston lubricating oil for the piston lubrication.

Looking from port to starboard on the gas-turbine-ship *William Patterson* showing exhaust end of the gasifiers. Photo shows air intake tanks and hoods to the exhaust end compressor cylinders of the gasifiers. You see gasifier bounce covers with piston cooling inlet at the center of the cover and the piston cooling drain at the bottom.



Here you have a bird's eye view of the Western Gear Works 6,000 hp main reduction gear. It is quite a job, both in size, weight and the work it has to do. The gear is a double-reduction, double-helical separate helix articulated-locked train-type unit. The gear elements consist of two high-speed pinions, four high-speed gears, four low-speed pinions and one low speed gear. A very fine piece of engineering.



We will report to you, with the cooperation of the Maritime Administration, the manner in which this gas-turbine-ship *William Patterson* is working out in service. About every six months you will find a short article in DIESEL PROGRESS telling you what the *William Patterson* has accomplished in actual service and that is of course, what we are all interested in and that is particularly true of the representatives of the big ship owning companies who were aboard here with me today. As one of them so accurately stated, "Let me see the figures a year from today and I'll tell you whether the free-piston engine is worth a hoot or not," and he didn't say "hoot."

DETROIT DIESEL'S NEW 6-110 ENGINE

By JIM BROWN*

INTRODUCED without fanfare in the 1957 DIESEL ENGINE CATALOG, the Detroit Diesel Engine Division is now manufacturing a new version of its 6-cylinder, series 110 engine which has incorporated in its design several noteworthy improvements. Using a slightly modified block, a new cylinder head, and a new gear train, the new 6-110 is scavenged by a Roots type, side-mounted blower instead of the end-mounted centrifugal blower with which the engine was originally introduced. A summary of the advantages gained by the design changes includes improved performance, improved fuel economy, a cleaner exhaust, simplified cylinder head design, reduced maintenance and a longer life expectancy. In addition, the new Roots blower 6-110 engine is much more versatile in meeting the installation requirements of new equipment and for replacing existing engines in used equipment. Besides having a shorter, lower and more compact silhouette the new design provides for more accessory drives and a more flexible arrangement of accessory drive locations. All of the design changes in the 6-110 engine are in keeping with Detroit Diesel's continuing policy of making improvements in the engine while retaining the same basic engine design and the interchangeability of as many parts as possible between previous models and the improved version.

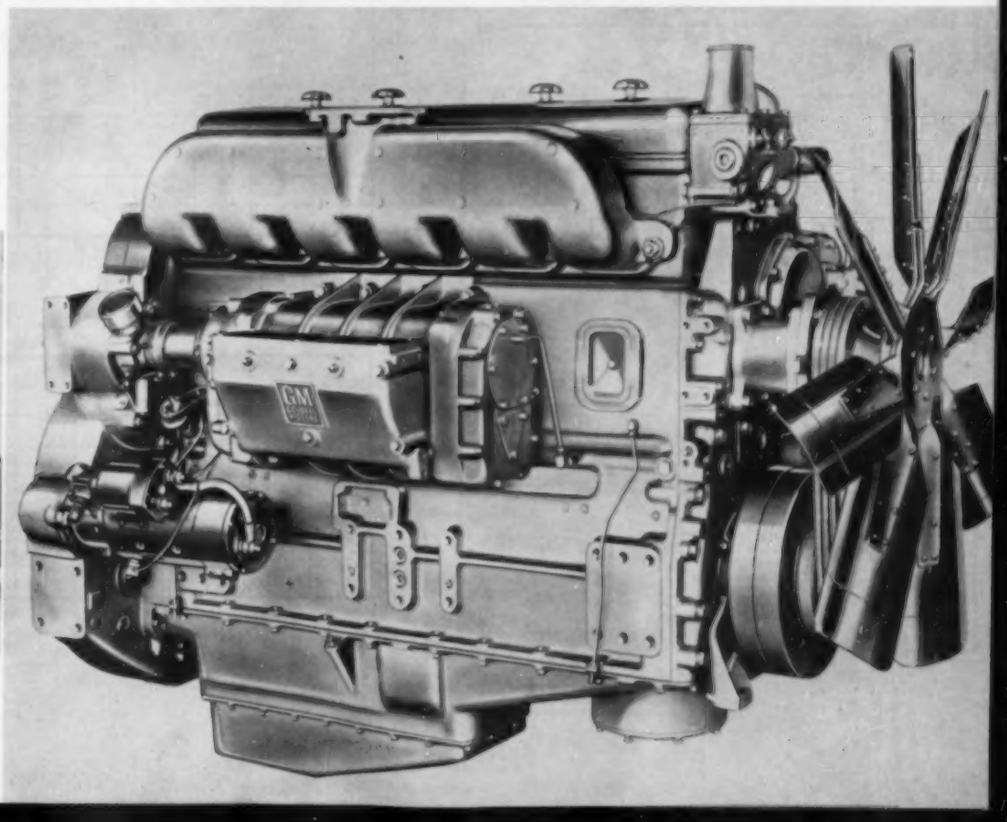
The new Roots blower 6-110 has the same high performance characteristics as the centrifugal-blower 6-110, with an unchanged maximum rating of 300 basic horsepower at 2000 rpm. Pistons, rings, liners, injectors, crankshaft, connecting rods and bearings are the same as in the previous model. The Roots blower shown in Figure (1) replaces the centrifugal type blower on the 6-110. At 800 rpm, it supplies approximately 60 cubic feet more air per minute than the centrifugal type; see Figure (2). The blower is driven from the blower drive gear of the gear train, and the ratio of the blower to engine speed is 2.86 to 1. The Roots blower used in the 6-110 is an improved 6-71 blower. This blower, shown in cross section in Figure (1) uses the same housing as the standard 6-71 blower. The end plates of this blower have been made thicker and heavier to receive heavier and wider front and rear bearings. The front bearings are roller bearings, while the rear bearings are a double row of ball bearings. These bearings are securely fastened to the rotor shafts and pressed into the blower end plates. The blower drive gears have been widened to allow for the increased capacity of the 6-110 over the 6-71. The rotors themselves are the same physical size as the rotor used in the standard 6-71; however, a longer stub shaft is used to accommodate the wider bearings, plates and gears. The front end cover is the same as the standard 6-71 engine while the rear end cover is the same as the 6-71T engine. Incorporated in this blower also are the new ring-type oil seals.

The gain in air flow at lower speeds, due to the adoption of the Roots type blower to the 6-110 is shown in Figure (2). How the improved air-to-fuel ratio at lower speeds results in improved fuel economy is shown in Figure (3). At and below 1200 rpm for instance, with 90 mm injectors, the new design yields a gain in fuel economy of approximately .014 lbs per bhp/hr. On the continuous bhp rating approximately the same savings in fuel consumption was effected at 1200 rpm, tapering only slightly to approximately .010 lbs per bhp/hr at either end of the curve. These gains in fuel economy yield a worthwhile dividend in cleaner exhaust for which GM Detroit 2-cycle Diesels are well noted. Increased over-all durability may also be expected due to cleaner internal engine parts resulting from improved combustion.

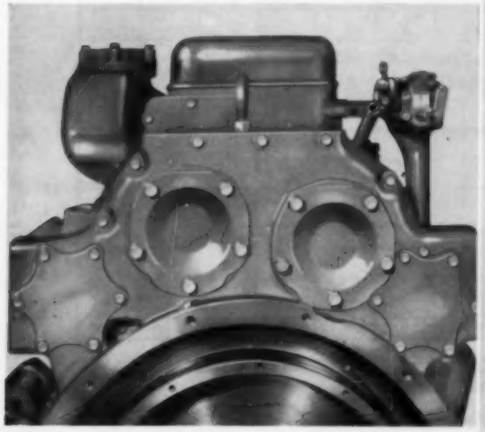
The only significant changes in the new 6-110 engine block evolved around the accommodation of the block to the Roots type blower, for which a mounting pad is cast in and machined on the side of the engine that formerly mounted the air intake manifold. Two hand-hold cover mounting pads have also been cast into this side of the block to provide for convenient inspection of the air box which surrounds the cylinder liners at the air intake ports. One of the important improvements in the cylinder head used on Detroit Diesel's Roots blower 6-110 engine is the casting of the water manifold within the head. This change eliminates the externally mounted water manifold previously used, and its attaching studs and gaskets. The top deck of the head is shown in Figure (4) and the integral water manifold in Figure (5). Increased rigidity has been given to the head by adding a rail to the top of the head, making the overall design similar to the cylinder heads of Detroit Diesel's series "71" engines. This rail also provides a mounting surface for the external fuel manifolds. Three bosses are cast inside the rail and are drilled and tapped to receive four fuel connectors. Rocker arms, fuel lines and manifolds are shown in Figure (6). Passages have been drilled inside the heads to eliminate the need for the former

Detroit Editor Diesel Progress

Detroit Diesel's Roots blower 6-110 engine; model 62306 shown.



Redesign of Detroit Diesel 6-110 engine provides four convenient accessory drives, here covered by plates on the rear of the engine. ➡



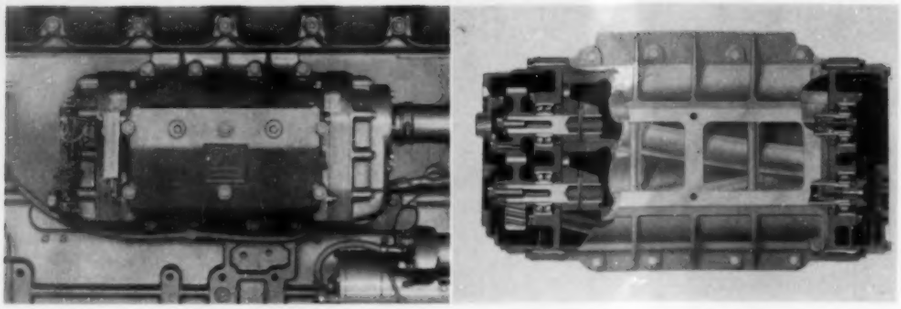


Figure 1. External and cutaway view of Roots blower used on 6-110 engine.

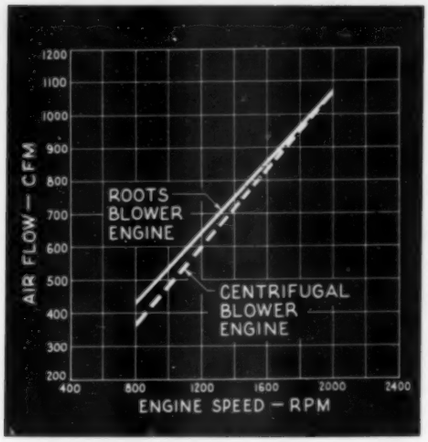


Figure 2. Improvement in air flow in Detroit Diesel 6-110 engine.

external oil lines. New oil drain holes have been located near the longitudinal center line of the head to allow oil return to the crankcase regardless of the angle at which the engine is operating. The shallow rocker cover is now held down by bolts mating with tapped holes in the rocker shaft brackets.

Tests have shown that longer life can be expected from the improved gear train design. The wider gears and the new helix angle will minimize gear thrust bearing wear. Increased durability of the gear train is accomplished by both using wider gears and changing the gear teeth helix angle to 17 degrees. The gear train for an RB engine is shown in Figure (7). As can be seen, the blower and camshaft loads have been divided by using a separate idler gear train for the blower which consists of two additional idler gears. This gear train can be rearranged for either right or left hand rotation engines. The accessory drive gear will be optional equipment for the customer. By referring to Figure (8) the positions of the various gears and their rotation can be determined. The lubrication system has been revised, as shown in Figure (9), in order to ensure the proper lubrication of all the parts affected by the change to the new Roots blower 6-110. The additional gears in the gear train are lubricated by means of drilled passages leading through the gear train housing from the engine cylinder block. The blower drive gears

Figure 8. 6-110 basic engine arrangements.

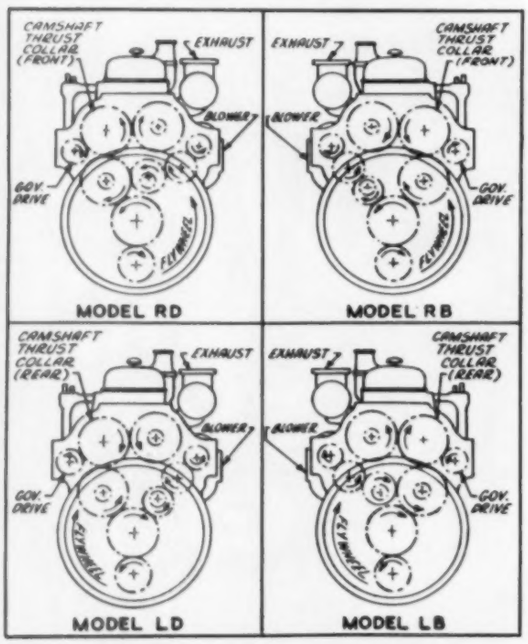
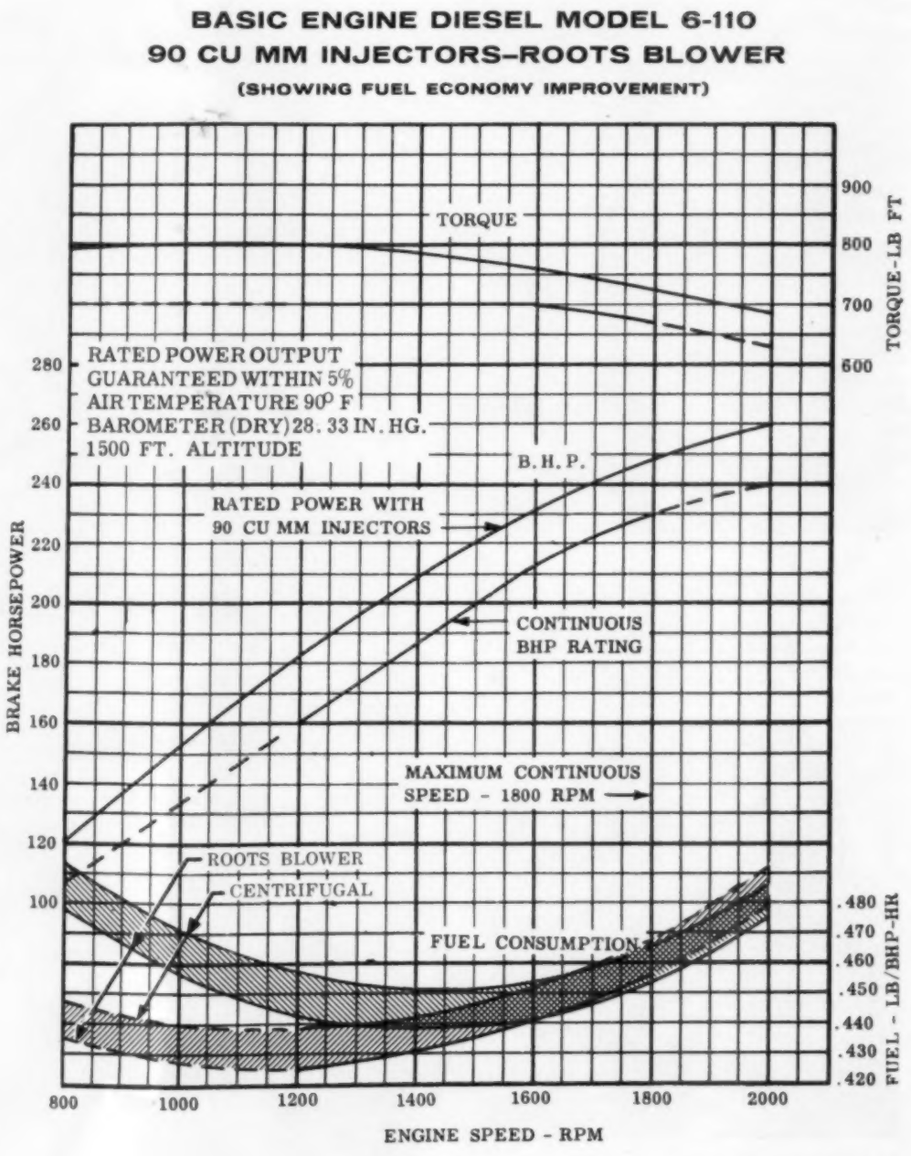


Figure 3.



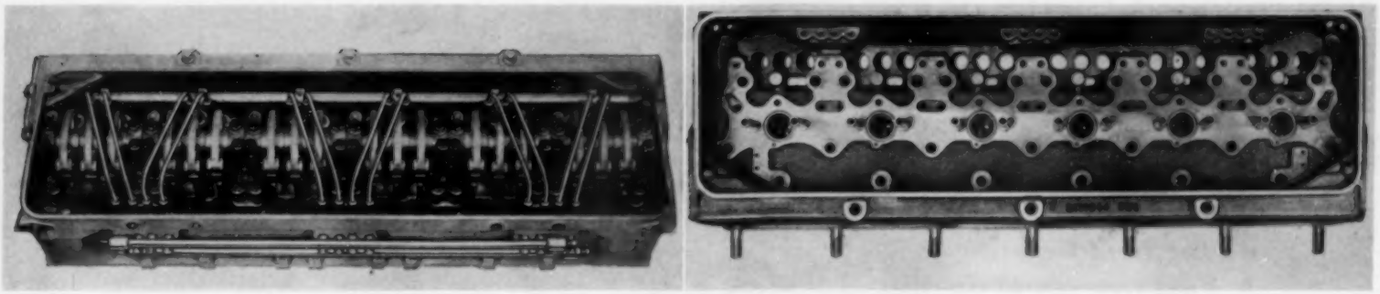


Figure 4. Top deck of new cylinder head on 6-110 engine.

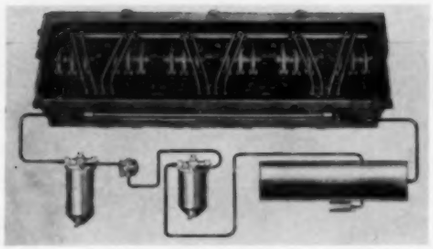


Figure 6. 6-110 rocker arms, fuel lines and manifolds.

full flow filter can be mounted on the engine oil cooler housing, or on the blower side of the engine and at either end of the block by means of a cast elbow. The double by-pass filters may be mounted on either side and either end of the cylinder block, depending on the arrangement of other accessories. For torque converter models a new one-piece casting is used to house both the engine oil cooler element and the torque converter oil cooler element. This oil cooler housing allows both elements to be in a horizontal line and reduces the possibility of equipment frame interference.

the flywheel end. Both the "B" and "D" models are furnished in right-hand or left-hand rotation.

The new 6-110 is manufactured as a fan-to-flywheel engine; industrial (base mounted) power units with mechanical or Torqmatic converter power take-off; as a twin engine industrial power unit; as a single engine or tandem twin marine propulsion unit and in a series of generator sets. Both the industrial power units and the generator sets are available with either radiator cooling or heat-exchanger cooling.

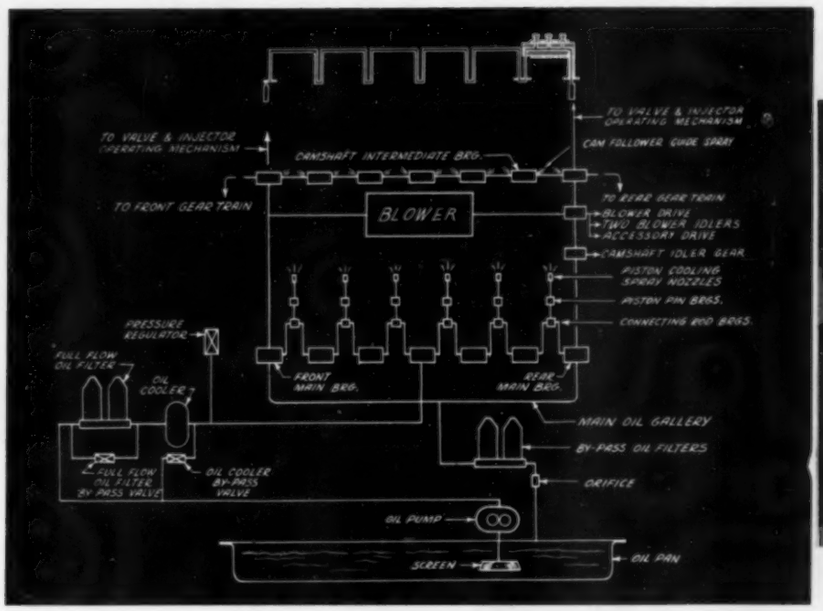


Figure 9. Redesigned 6-110 lube oil system.

Figure 5.

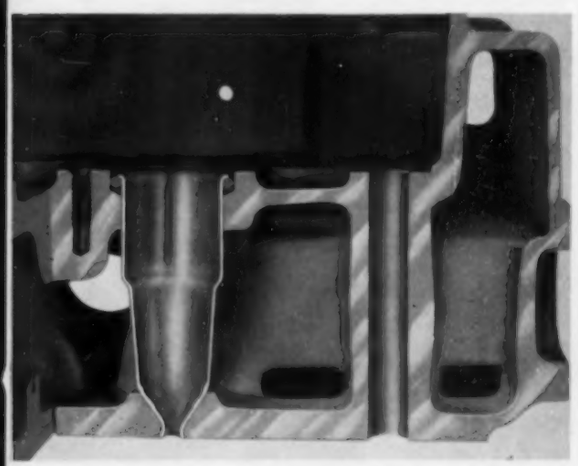
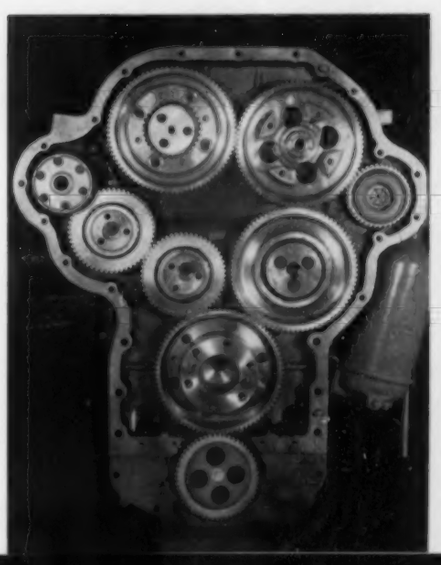


Figure 7. Gear train on 6-110 RB engine.



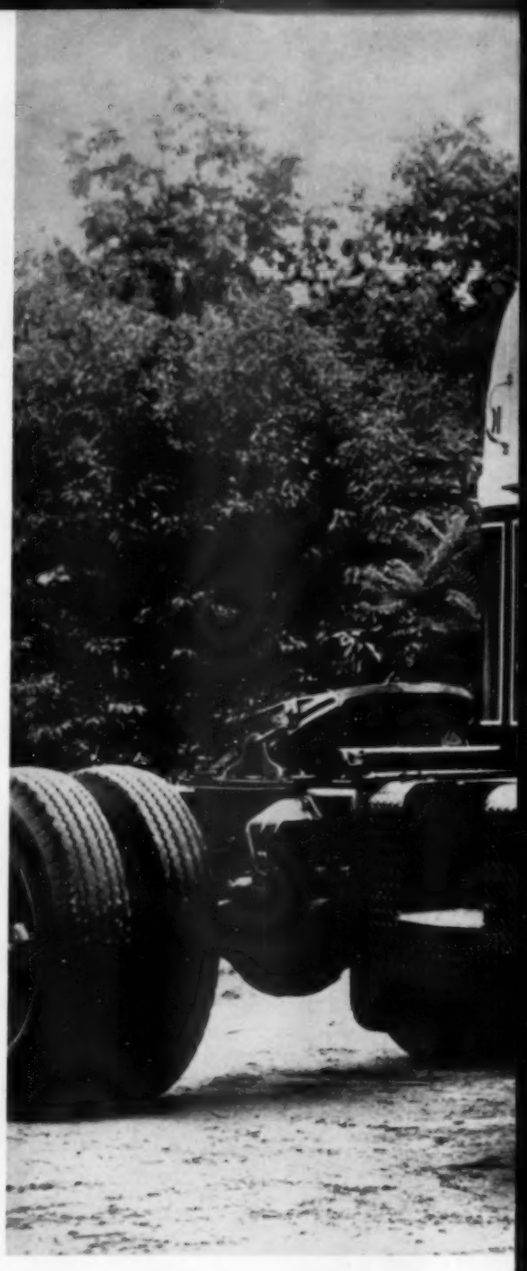
are lubricated by the excess oil from the blower drive assembly. The front of the blower is lubricated by means of an external line leading from the main horizontal oil gallery on the side of the engine. Oil is forced to the rocker arm assembly by means of vertical and horizontally drilled passages leading to the rocker shaft bracket plate, up the rocker arm bracket, and then to the hollow drilled rocker arm shaft. The oil travels from one rocker arm assembly to the adjacent rocker arm assembly by means of the cast groove located under the rocker shaft bracket plate in the cylinder head. This new lube oil distribution system eliminated the external oil lines that were used in the former 6-110. Possible locations for the mounting of lube oil filters have been increased. The double

The fuel pump has been relocated in a higher position which permits shortening of the fuel lines. The fuel manifolds are mounted externally on the side of the cylinder head as shown in Figure (4). New jumper lines lead the fuel from the fuel connectors in the head to the injector filter caps. The fuel strainer and filter are bolted directly to the cylinder head, eliminating the bracket formerly used on the 6-110. Basically, the new Detroit Diesel 6-110 engine is furnished in two models—the "B" and "D". In the "B" model, the exhaust manifold, blower and cylinder head water connection are to the left side of the engine as viewed from the flywheel end. In the "D" model the exhaust manifold, blower and cylinder head water connection are on the right as viewed from

FREIGHT LINES GROW IN NEW ENGLAND

Good Management, Diesel Economy, Competent Service Organization, Excellent Facilities, Quick Delivery And the Best Relations with Shippers Add up to Fast Growth of the Quinn Freight Lines

By ARNOLD B. NEWELL



BROCTON, Mass.—A new terminal and maintenance garage has been built in this New England town to take care of the rapidly expanding business of the Quinn Freight Lines. This company is the only New England trucker operating an over the highway fleet that is 100% diesel equipped. All told the vehicles total 315 of which 55 are White Model 24 TD tractors weighing 12,000 pounds powered by Cummins Model HRB 600 diesel equipped with Fuller 10-speed Roadranger transmissions.

The Quinn Company operates between Portland, Maine and Richmond, Va., specializing in LCL shipments, store-door deliveries and fast schedule. In addition to the diesel driven tractors the company has 175 trailers, 50 trucks and 30 gasoline engine powered White cabover tractors for use around town. The trailer fleet is made up of 100 volume vans, 50 open tops, 19 reefers and 10 flat tops. This fleet places Quinn in seventh place in point of size amongst New England freight lines.

Freight movement currently averages 7 million pounds per week. The annual total is in excess of 300 million pounds, average freight load is 30,000 pounds moved over the highway at 6 to 6.1 miles per gallon of diesel fuel. The current annual gross revenue is $4,500,000. Daily mileage per tractor ranges from 400 to 1,000 miles on a driver relay basis. The driver changes are made at halfway points and in this way the men always double back over the same routes.

It is estimated by the owners that the total annual saving in maintenance and fuel cost resulting from use of diesel tractors in 1956 was 10 per cent of the gross revenue or $351,000. Of this amount 2 per cent of the gross revenue is credited to saving in the cost of fuel alone, the figure being $70,200 for that year. The cost of maintenance alone has gone down over 57% on the result of using diesels.

According to Thomas J. Lyons, Treasurer of the company, the engines in the tractors have more than adequate power to maintain the usual highway speed limits which he considers fair and adequate for swift freight movement. Extra power is needed to cope with conditions north of the New Jersey line. South of this point the going is much easier and therefore helpful to their policy of fast operation. Fewer interruptions of continuous movement are more important than high speed on the road when it comes to saving time.

Fast deliveries and special attention to LCL shipments coupled with store door deliveries are powerful factors contributing to success of the Quinn Freight Lines. A single example of how it works out is one shipper who said he saves half a million dollars annually in inventory through the prompt service provided by the Quinn Freight Lines. The Whites in the fleet powered by Cummins diesels and 10-speed Roadranger Fuller transmissions are looked upon by the owners as an unbeatable combination. They turn in an average of 125,000 miles of dependable service annually and since the fleet is less than two years old it has not been necessary to completely rebuild the engines and transmissions according to George F. Adams, Superintendent of Maintenance and Linc Dunbar, Garage Superintendent.

The new terminal is modern in all respects. This is especially true of the garage which will house 50 tractors at one time and has more capacity than has been needed to date. It is kept in a clean, orderly condition under the able supervision of Leo Crowe, Service Manager. There is a mechanical ventilating system to keep it clear of exhaust fumes and it is air conditioned for summer comfort. In addition, the structure was placed in a way to take advantage of the prevailing winds in the area to provide the best natural ventilation. Tractors coming in for reservicing or repairs are spotted in one place and never moved until they are ready for the road. All servicing facilities are portable and they are brought to the tractor.

Garage work is highly specialized. All of the tractors are cleaned and waxed by one man. None are washed. Another does all the greasing and can turn out five a day. A third man takes care of fueling and still another is assigned to changing oil. Each man is responsible for the work he does. Engine work and the repairs on other mechanical components fall under another head. Garage facilities for trailers repair work are such that a complete new trailer could be built in the shop.

A spare engine is carried in stock at all times. Other spare parts are carried in adequate numbers. Facilities are such that a spare engine can be installed in two days and the damaged engine can be completely rebuilt in the shop. In addition to the smaller parts in stock, the garage has on hand six cylinder heads, a crankshaft and three starters. Lubricating oil is stored in a 1,000 gallon tank and pumped to the tractors. Fuel is similarly pumped, through portable hose from a 15,000 gallon storage tank.

When a driver comes in he hands over a trip ticket report on all defects that have shown up on the road. This includes everything even to a defective switch or a horn push button needing attention and, of course, all major items as well. This in combination with the routine inspection made in the garage reveals what is required to be done. If a tractor breaks down on the road another is sent out equipped with the "Big Ben". This is a portable crane capable of lifting the trailer and placing it on the replacement tractor. The damaged unit is then returned to garage for repairs. When the trip inspection is made after each run an inspection sheet is filled out for each tractor and another for the trailer. By this system a running record is maintained for each piece of highway equipment.

More dependence is placed on immediate attention to every repair item showing up on the trip ticket

tires are stocked at regular intervals along the routes traveled.

The new terminal was designed and built for maximum freight handling convenience and efficiency. Outbound freight moves in on one side of the loading platform and is transferred across to the outbound trailers. Reverse movement applies to inbound freight transferred to the distribution trucks. Parking facilities on both sides of the freight house are spacious and well paved with room for fleet expansion.

In reply to a question regarding future growth of Quinn Freight Lines, Mr. Lyons said he expects the line to grow but he does not foresee any New England trucking operation on the very large scale of some of the mid-continent companies. This viewpoint is prompted by the fact that inland operators occupy a position likened to the hub of a great industrial wheel. New England is bordered on one side by the Atlantic Ocean which permits operators to fan out over about half the area of the ones inland. However, the advantages of shipment by highway transportation attract increasing numbers of shippers to local lines offering fast careful service and keeping good customer relationship.

One of the White tractors Cummins equipped in the Quinn fleet serviced, waxed and ready for the road. All of the rolling equipment is kept in perfect condition.

Tractor and trailer with inbound cargo backed into freight shed for redistribution of the load and local delivery. After a long trip over the road the rolling stock looks as if it just came off the assembly line. Even the station paving is spotless.

and inspection sheets than on periodic maintenance based upon elapsed time or mileage. However, oil changes are made monthly, oil filter refills are changed every second month and air filters are cleaned each 10,000 miles. Brakes are adjusted whenever the driver mentions them on the trip ticket. Otherwise they are re-lined each 80 to 100 thousand miles. Valves and fuel injection equipment are adjusted each 15,000 miles. If reconditioning of the fuel injection equipment is needed it is returned to Cummins. The valves are ground each 120,000 miles. Transmissions are opened up each 100,000 miles and worn parts are replaced if necessary. During the first 18 months no major part needed to be replaced. Mr. Adams says they are the best he has had any experience with and the ratio is just right. At 200,000 miles the Spicer clutches had not required replacing.

Trouble on the road is infrequent. None the less, with so many tires in service the law of averages demands tire changes en route. To meet this condition the tires on the tractors and the trailers are all standard 10-20 of uniform quality. Spare

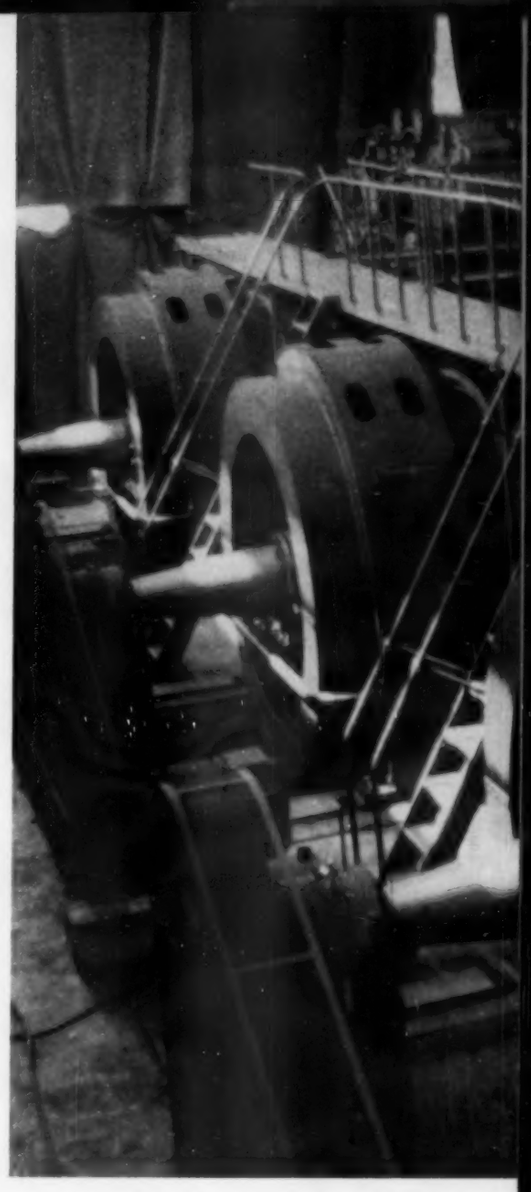
B.C. POWER COMMISSION OPENS THREE NEW PLANTS

By W. J. GRANBERG

THE end of summer saw three new diesel generating plants completed by the British Columbia Power Commission at an estimated cost of $7,000,000, powerhouses that represent only the first stages of an expansion program in three towns where units will be added as needed. All the plants began operation on oil, but switched to natural gas in early fall when pipelines from Alberta wells began serving the towns. The commission's projects at Quesnel, Prince George and Dawson Creek called for 10 Cooper-Bessemer diesel engines, supplied through Simpson-Maxwell, Vancouver, at a cost of $3,735,000, while approximately the same amount was spent for other equipment and plant construction. These bring to 101 the number of diesel units in use in 32 plants operated by the public utility which serves 200 towns and villages in an area of 7,600 square miles.

Population increases in the three towns in central B. C. called for construction of enlarged plants, spacious enough to house many more generating units than initially went into operation. Typical of them is the new powerhouse at Quesnel, a three-story building, apart from the pumphouse, which was designed to house 20 units. Three were in operation when the plant opened, while the fourth diesel was on order and will be installed before the first of the year. The diesels are Cooper-Bessemers, type LSV16, developing 4,210 horsepower each. As it went into operation, the new plant had an aggregate output of 9,000 kilowatts from Westinghouse generators. These, direct-driven by the 16-cylinder diesels, are rated at 375 kva, 6,900 volts and 314 amperes. The exciters were supplied by Electric Tamper & Equipment Co. and are 40 kw. Emergency power and plant service is taken care of by a six-cylinder, 150 kw Vivian diesel.

In the yard opposite the power plant, which is 160 feet long and 90 feet wide, stand 10 Bepco circuit breakers and two Moloney Electric Co. transformers. Pointing to the sky from an overhanging deck of the building are the Cooper-Bessemer exhaust mufflers. The multi-duty filters on the engines were supplied by American Air Filter Co. High voltage cables were furnished by Johnson & Phillips Co., England. Cooper-Bessemer engine panel equipment and Square D control panels were used throughout all three plants, for the installations are virtually identical. Switches in the control room on the mezzanine floor are English Electric Co. products. Other equipment includes the following: DeLaval oil purifiers and lube oil circulating pumps; heat exchangers built by Horton Steel Works, Fort Erie, Canada; industrial gas detector by Johnson, Williams, Inc., and Allis-Chalmers water circulating pumps which move 730 gallons a minute. Water for cooling comes from the Fraser River nearby and the pumphouse, situated at the foot of a slope below the powerhouse, is served by a 36-inch line. Three 12-inch lines branch off to three Worthington centrifugal pumps, two 50-horsepower and one 25-horsepower. The supply and discharge lines are 16-inch and the take-off lines to the engines are six-inch. The new powerhouses at Prince George and Dawson Creek were built along the same lines as the Quesnel plant and all were built with an eye for expansion in the future. The Prince George plant went into operation with four 4,210-horsepower Cooper-Bessemer units, with prospects this powerhouse will some day be increased to 80,000 horsepower. At Dawson Creek, three 4,210 horsepower and two



Here are the three 4,210-horsepower Cooper-Bessemer diesel engines, driving Westinghouse generators, which began turning over in the new Quesnel plant in late summer. A fourth diesel was on order and will be installed before the first of the year. Original operation was on oil, but the conversion was made to natural gas soon after the plant opened.

The three-story concrete structure at Quesnel is 160 feet long and 90 feet wide. The new plant had a total of 9,000 horsepower as it began operation. American Air Filters and Maxim Silencers.

1,410-horsepower engines, all Cooper-Bessemer, gave the plant an initial output of 15,450 horsepower. T. S. Christie is superintendent of plant construction for the power commission and Robert Christie is the diesel installation foreman. L. A. Dye directs the electrical work.

While this new plant construction work was under way, an addition was being built to the powerhouse at Terrace, near Prince Rupert, in expansion work costing $211,000. Here a 1000 kw eight-cylinder Cooper-Bessemer increased the plant's output to 4,200 kilowatts. The power commission acquired this plant in 1945 and growth of its service is indicated by the fact that since that time the number of customers served has increased to 1,200 from 59. Although the power commission has made no announcement of new plant construction for the immediate future, indications are that further expansion is inevitable. The arrival in 1957 of natural gas to towns in the province means that this fuel will be used wherever it is available, with conversions from oil to gas counted on as pipelines are extended. Economies in operation achieved by the public utility are exemplified in lower power charges, with rates down to 2.4 cents per kilowatt hour, as compared with five cents 10 years ago.

Ten Bepco circuit breakers and two Moloney transformers stand in the yard opposite the new powerhouse at Quesnel, B. C., which was put into operation late last summer. It is one of three such plants completed at a cost of $7,000,000.

TUTTLE CREEK DAM

By L. H. HOUCK

TUTTLE Creek Dam, near Manhattan, on the Big Blue River, 12 miles above its junction with the Kansas River, with Stages II and III now under contract, will cost $90,000,000 but, according to estimates of the Corps of Engineers, U.S. Army, it will return $1.50 for every $1 spent, in saving recurring flood damage, almost always associated with needless loss of irreplaceable human life. As long ago as 1937, the Corps of Engineers realized the need for Tuttle Creek Dam and its first recommendation that year resulted in Congressional authorization in the Flood Control Act of 1938. Further engineering studies and economic investigations in the Kansas River Basin showed the continuing need for Tuttle Creek Dam, named for a nearby creek. Congressional acts of 1941, 1944 and 1954 included Tuttle as an element of basin plans. The first appropriation was voted right after the disastrous 1952 flood and construction started with $5,000,000. Work was interrupted by lack of appropriations in 1953 and 1954. Congress appropriated $7,500,000 in 1955 and $9,000,000 was added in 1956. Two important contracts were awarded by the Corps of Engineers in 1956. Stage II, Stage I having been completed, was awarded to the Tecon Construction Co., Dallas, Texas, for building the outlet works, for $3,673,154. Stage III, consisting principally of the spillway excavation, involving about 9,000,000 cu yds of earth, rock and shale excavation, was awarded to List & Clark Construction Co., Kansas City, Mo., for $4,238,093 and this contract is 55 per cent completed.

Tuttle Creek Dam is 7,500 ft long and 1,640 ft wide at the base. The crest is 50 feet wide and 157 ft above the stream bed. Relocated Kansas Highway 13 will cross the valley over the crest. The embankment will contain 20,000,000 cu yds of material, mostly shale and rock. Under present legislation Tuttle Creek was to operate as a dry dam to be used for flood control only but Congress has now approved it for water storage. List & Clark's contract for the spillway is a big earth moving job requiring high capacity equipment—the big dams are always built by diesels. The spillway is a big dam's safety valve. It is located in a natural flowageway in the rim of the reservoir beyond the east abutment of the dam, high above the river bed. It is designed to prevent overtopping the dam and damage to the embankment during flood conditions. Tuttle Creek's spillway consists of an approach channel approximately 1,500 ft long, a concrete structure 840 ft long and 94 ft high, equipped with eighteen 25-ton gates, each 40 by 20 ft; a concrete lined chute 600 ft long and an outlet channel connecting with river below dam.

The spillway excavation consists of 3,295,000 cu yds, of rock in the Cottonwood, Neva, Eiss, Merrill and Middleburg limestones of the Council Grove group of the Permian Age. It contains 1,950,000 cu yds of various shales, mostly Hooser, Stearns and Eskridge. Spillway outlet channel required 697,000 cu yds of excavation, bringing the total excavation for Stage III to 4,150,000 cu yds and the total fill to 8,234,000 cu yds. Bedrock is being used in the dam, Cottonwood limestone is being used as riprap, being the most durable rock on the project and the berm fill consists of surplus excavated rock and protective stone. List & Clark had to excavate a 7 ft thick ledge of Cottonwood limestone estimated at 190,000 cu yds separately to qualify it for riprap. This was drilled for blasting with two Joy wagon drills, using 1¼-inch round steel and 2¼-inch timken threaded multi-use rock bits. Loaded with Hercules Hercomite 3 the subsequent blast produces 10 cu ft of broken rock for each 4 lbs of dynamite. Each blast usually consists of 120 to 180 holes. Air compressor is a 500 cu yd Gardner-Denver with Caterpillar diesel. For loading out all types of material List & Clark had a Manitowoc 4500 dragline with twin 6-71 GM diesels, swinging an 8-cu yd Hendryx bucket; a Manitowoc 4500 shovel with a 5½ cu yd dipper, powered with a 600 hp Cummins diesel; an 80-D

Joy No. 225 rotary blast hole drill was mounted on tracks and frame of a D8 Caterpillar tractor. Power plant at rear, 4-71 GM diesel powers drill and all other functions of the outfit, which drills 2000 ft of 4½-inch hole every 16 hours. Here it is drilling 35 ft holes in the Eskridge shale and the Neva limestone.

Dean Peters (left) is general superintendent for List & Clark and W. T. Buford is assistant superintendent.

Allis-Chalmers HD-20 holds up its extra wide blade for inspection. This one, one of three such units used to keep the rocks and spill cleaned up around the shovels and draglines. Saves big tires on the hauling equipment.

Northwest 3½ cu yd shovel with a Murphy diesel and two No. 95 Northwest draglines with Murphy diesels and using 2½ cu yd buckets.

The shale was drilled with a Joy rotary which had been field mounted on frame and tracks of a D8 Caterpillar tractor from which controls and engine had been removed. A 4-71 GM engine was mounted on the front end and powered all functions of the drill including traction. One operator drills, moves up to position and drills again with the machine producing 2000 ft of 4½ in. hole in 16 hours per day. The job works two 8 hour shifts daily. Hauling fleet consists of 19 units consisting of Athey 27 cu yd wagons with Euclid tractors and 6-110 GM diesels; 25 cu yd Euclids with Cummins and GM diesels and 16-ton LeTourneau-Westinghouse Tournarockers with Cummins diesels.

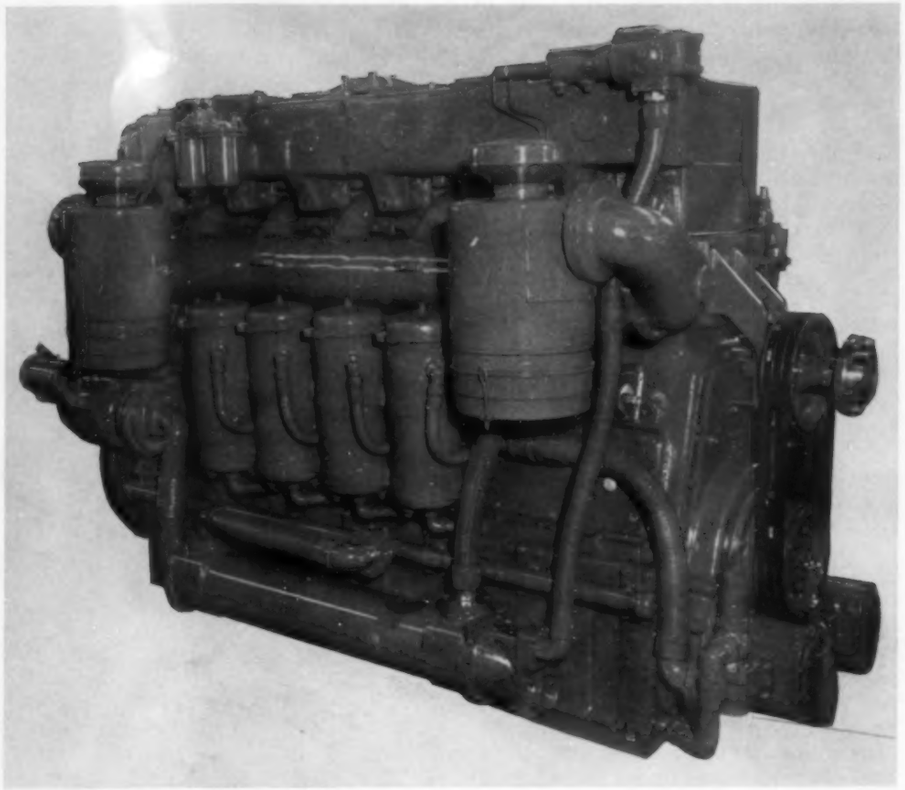
Other diesel equipment consists of three HD20 Allis-Chalmers tractors equipped with extra wide bulldozer blades and powered with both AC and GM diesels, which keep the rocks off the runways to save expensive tires on the heavy-duty hauling equipment which is operated at top speed. Tuttle Creek Dam is an important unit in the Pick-Sloan Flood Control Plan which is designed to control floods from the various river basins in a 12-state area. It is being built under the jurisdiction of the Kansas City District, Corps of Engineers, U.S. Army of which Col. E. B. Adams, is District Engineer. Project engineer for the Corps is B. V. Reany and J. H. Dennis, is office engineer, with the latter two being located in the administration office at the dam site. List & Clark Construction Co., Kansas City, Mo., is a veteran big dam contractor, having built other dams in the upper reaches of Nebraska, South and North Dakota. Dean Peters is general superintendent for List & Clark and W. T. Buford is assistant superintendent. Tuttle Creek Dam will be closed in 1959 and the project completed in 1961, according to present plans. Half of its cost will be used for the relocation of three small towns, a railroad and a highway.

Manitowoc 4500 dragline with a 10 cu yd Hendryx bucket loading 25 cu yd bottom-dump Euclids with 6-71 GM diesels. Rig is working in Eskridge shale used in the embankment.

Tuttle Creek Dam takes shape on Big Blue River near Manhattan, Kansas, as Stage III contractor, List & Clark Construction Co., Kansas City, makes the dirt and rock fly.

360 HP FOR MANITOWOC SHOVEL

VISIT the job site of the Terramana Brothers Coal Company, Steubenville, Ohio, and you will find a new Manitowoc 4500 powered by a White Superior Diesel engine digging in against a wall of overburden 70 foot high with the utmost ease and operating economy. A 60 foot boom with a 45 foot stick provides the shovel with the necessary reach to dig the embedded rock, clay and slate from the sidewall and deposit it on a spoil pike of approximately the same height. Economy highlights this operation as the big 4 yard rig, working on a quick cycle literally powers away almost 400 yards of overburden per hour in one of the most efficient stripping operations from a time and cost standpoint in the company's history. Officials estimate production costs on this job to be almost 20 percent less than that of previous equipment used on similar jobs.



Superior model 40 shovel engine of 360 continuous horsepower. Standard equipment includes pair of Air-Maze air filters; Purolator duplex fuel filter; Winslow lube filters; Ross heat exchanger; Amot temperature controls; also, Aeroquip and Stratoflex flexible metal hose.

For Terramana, this appreciable reduction in stripping costs was brought about through an extensive study of primary operating problems prior to the final selection of the unit. It was learned that operating costs were gradually climbing, and it became apparent that stripping costs had to be reduced to effect a continued profitable mining operation. Furthermore, experience had shown that operating a shovel at a minimum cost in repairs and overall maintenance was contingent to a great extent upon: (1.) Design characteristics of the unit. (2.) The particular design and horsepower rating of its power plant. With this in mind the brothers made another study of those factors governing maximum output of a shovel at the very minimum in operating and maintenance costs. After considerable deliberation the Manitowoc 4500 was selected as the unit most suitable for the job.

Horsepower looms as factor: Satisfied the shovel has the necessary stability, maneuverability and design characteristics to effect an economical operation, the company concerned itself with the all important source of power. One of the foremost considerations was that of selecting a power plant capable of delivering sufficient horsepower to permit the engine to operate without strain under the most adverse digging conditions. In short, they were looking for "true" horsepower, or that which is rated at actual conditions of operation, and not under idealistic conditions which is rarely the true pattern of operation. According to Albert Terramana, the misconception on the part of operators as to the horsepower rating of an engine can result in operating and maintenance costs far exceeding that of normal. "All too frequently," he says, "it has been necessary to operate a shovel engine at its maximum power in order to bite into heavy overburden. This 'wide open' type of operation greatly increases costs and frequently causes a shovel to breakdown completely due to the working strain." In selecting the White Superior Engine for their rig, the continuous conservative horsepower rating of 360 proved more than adequate.

The engine has sufficient horsepower and torque to enable the shovel to take a healthy bite from the overburden and swing back to the spoil pile at a speed near that of idling. This ease of operation, due to "true" and adequate horsepower, has proven a decided factor in the overall operating economics of the unit which is now in service for two, ten hour shifts every working day without any shutdown.

GAFFER II, VERSATILE YAWL

By ARNOLD B. NEWELL

GAFFER II is the kind of yacht you decide you would like to own just as soon as you set eyes on her for she has a combination of qualifications seldom found in a vessel 61 ft long. She is one of the few auxiliaries of her type equipped with a diesel. Graceful as a swan, lofty like a square rigger, her handsome appearance is that of a deep narrow boat. However, her draft is only 4 ft 8 in. and her beam is 16 ft 6½ in. Within these confines we find all the amenities of a fine home on land with a spacious main cabin that looks and is larger than similar quarters on most power yachts of her size. The galley is very well equipped. The designers, M. Rosenblatt & Son of New York City, have incorporated in the design the requirements of the owner for an easily handled, shoal draft, cruising boat. They have provided these—a powerful modern hull and rig that is at once pleasing and very successful. *Gaffer II* is a centerboard yawl with a General Motors 4-51 propulsion auxiliary diesel driving through a Walter Vee-Drive with 3:1 reduction.

Main cabin forward end.

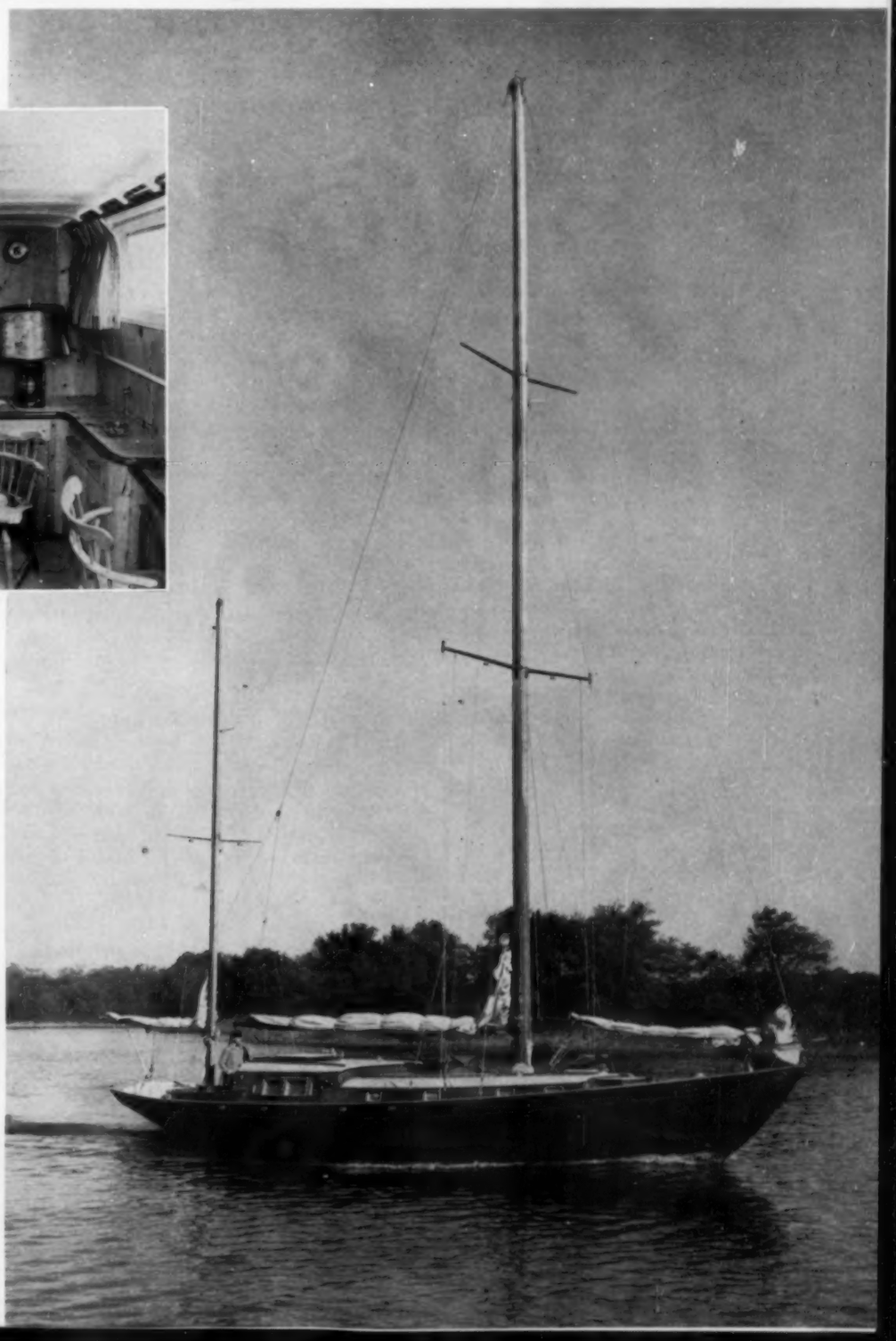
The owner, Mr. Frank H. Wheaton, Jr. is a well known yachtsman of Millville, New Jersey. As he does not intend to race the boat the rig is a well balanced one for maximum ease of handling. It stands under working canvas without running backstays. In competitive sailing, however, the lofty masthead yawl rig should enable *Gaffer II* to make a good showing. The yachtsman who enjoys sailing and at the same time the comforts of home, all in one, will find the arrangement of quarters extremely interesting. The light airy main cabin's knotty pine finish accentuates warm livability. The spacious galley is modernly equipped with a combination freezer-refrigerator and built-in gas stove with oven units.

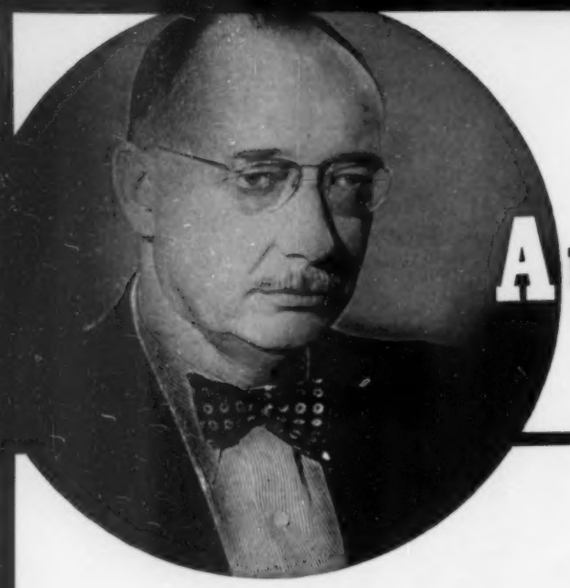
The bronze strapped hull is double planked with African mahogany over cedar and has teak decks and rail cap while the deck joiner work also is of African mahogany. This excellent construction was carried out by Stowman Shipyards, Dorcester, New Jersey.

Principal Characteristics

Length oa	60 ft 11½ in.
Length wl	43 ft 9 in.
Beam	16 ft 9½ in.
Displacement	53,000 lbs
Sail area	1565 sq ft

It should be noted that the pleasing lines of the yacht and her handsome profile completely belie the shoal draft required by the waters of Mr. Wheaton's usual cruising ground. She is a particularly versatile and able yacht with good sea keeping ability enabling her to perform well off shore in deep water.





AUTOMOTIVE DIESEL PROGRESS

A COMMENTARY BY **MERRILL C. HORINE**

Merrill C. Horine, for 38 years a member of the Society of Automotive Engineers, has been actively engaged in automotive engineering, sales promotion and training, advertising and editing of automotive publications since 1907. He has contributed numerous papers on diesel and allied subjects to the SAE and other organizations. An officer in the Air Service in World War I, he was a consultant to the Chief of Ordnance and the Automotive Division of the War Production Board in World War II.

Automotive Diesel Control—Part II

Over-injection with Turbo

Over-injection is particularly a problem with turbocharged diesels, for upon starting or accelerating from drifting, there is always a deficiency of air while the injection system tends to dump excess fuel into the cylinders. The result is excessively smoky exhaust and all that goes with it. For this reason auxiliary controls have been developed and adopted on some engines whereby this is avoided.

These controls limit the maximum volume of injection according to the air pressure in the intake manifold. Manifold pressure is utilized as the governing medium, through a diaphragm or bellows, which opposes a spring. At low manifold pressure, accordingly, the spring moves the metering limit to a limited maximum. As pressure builds up in the manifold, the spring is progressively overcome by the diaphragm or bellows until at full pressure, maximum injection volume is permitted. Although partially prompted by increased police activity against excessive exhaust smoke in a number of the states, these devices are bound to prove beneficial in avoiding needless waste of fuel and by decreasing carbon formation.

Speed Dip

By Speed Droop is meant an inbuilt ability of the governor to sense and respond to appreciable changes in load, thereby giving the driver a "feel" of the load largely denied by automatic modulation of metering by the governor. Such speed droop might more accurately be described as Speed Dip, since the slight slowing of the engine upon increase of load is followed by automatic recovery of speed to that directed by the fixed accelerator position. The opposite effect, naturally, follows a marked decrease in load, causing the engine to momentarily exceed the set speed. Both of these effects are useful to the driver, serving as a warning of the impending desirability of shifting to a slower gear in the event of increase in load, or to a faster gear with a decrease.

Idling Speed

Most, but not all governors also control idling speed. This is for the purpose of compensating for differences in fuel, changes in the engine's condition, etc., which would cause a change in idling speed where a fixed metering stop were employed for the purpose. Also, the fixed stop would prevent the metering control moving to no-delivery position for maximum retardation in drifting or coasting. In closely-attended engines, such as in stationary and marine applications, this is unnecessary; but owing to the fact that in automotive use, the engine operates unattended and some variation in fuel characteristics is to be expected, governor-controlled idling is desirable.

With all of these functions being performed by modern governors, it would seem that the limit had about been reached. Yet there are other tasks which, if practicable means of accomplishment were found, would result in improved operation.

Safe Operating Range

A cardinal rule in good diesel driving is to keep the engine within the safe operating range when full accelerator is used. This range varies with different engines, but is generally believed to lie between 65 per cent and 95 per cent of the maximum governed speed. Skillful diesel drivers therefore maintain a constant watch on the tachometer, shifting down when the speed approaches the low end of the range and up when it reaches the high end, when full accelerator is used. In line with the modern trend toward automation, it might be advantageous to have a governor which by some means would confine full-power operation within the safe range. This might be no more than a governor-actuated warning signal which would apprise the driver of the need to shift or which would over-ride the accelerator control and reduce the speed of the engine at such times, thereby forcing the driver's cognizance.

Starting

In the normal functioning of the governor at starting, full fuel delivery is called for until the engine responds and attains governed speed. This results in drastic over-supply of fuel at starting, which occasions unnecessary violence of initial firing and the emission of smoke. Reduced delivery at this time would undoubtedly permit equally quick starting and eliminate these two undesirable results. That the rarification of the atmosphere with altitude above sea level has an effect upon the power output of all internal combustion engines has long been recognized and is one of the reasons for the use of superchargers. But in diesels, this decrease in air weight with altitude has incurred difficulties apart from mere loss of power. As in the case of torque control in reverse for turbocharged engines, the tendency is toward over-injection at higher altitudes. This has given rise to aneroid control, which in some applications is incorporated with the manifold pressure control previously referred to. However, the altitude aneroid is connected with the air intake ahead of the supercharger, if any, instead of after it. In one system, developed by the American Bosch Division, both controls act upon the same system of levers and wedges.

Other Functions

Temperature and oil pressure gages are always provided on motor vehicles, but a certain number of drivers persist in ignoring them. This is particularly apt to be the case in night driving when many drivers perfer to extinguish their instrument lights. To the suggestion that the instruments be supplemented by warning lights or buzzers, which have actually been used in some cases, the reply is usually that with similar signals in use for low air pressure, high-beam headlights and the proposed safe driving range limits, the instrumentation would become overly complex. It is a tribute to the quality of product which automotive diesel manufacturers turn out that so few engine failures result from these causes.

DIESEL-ELECTRIC DRILLING PACKAGE

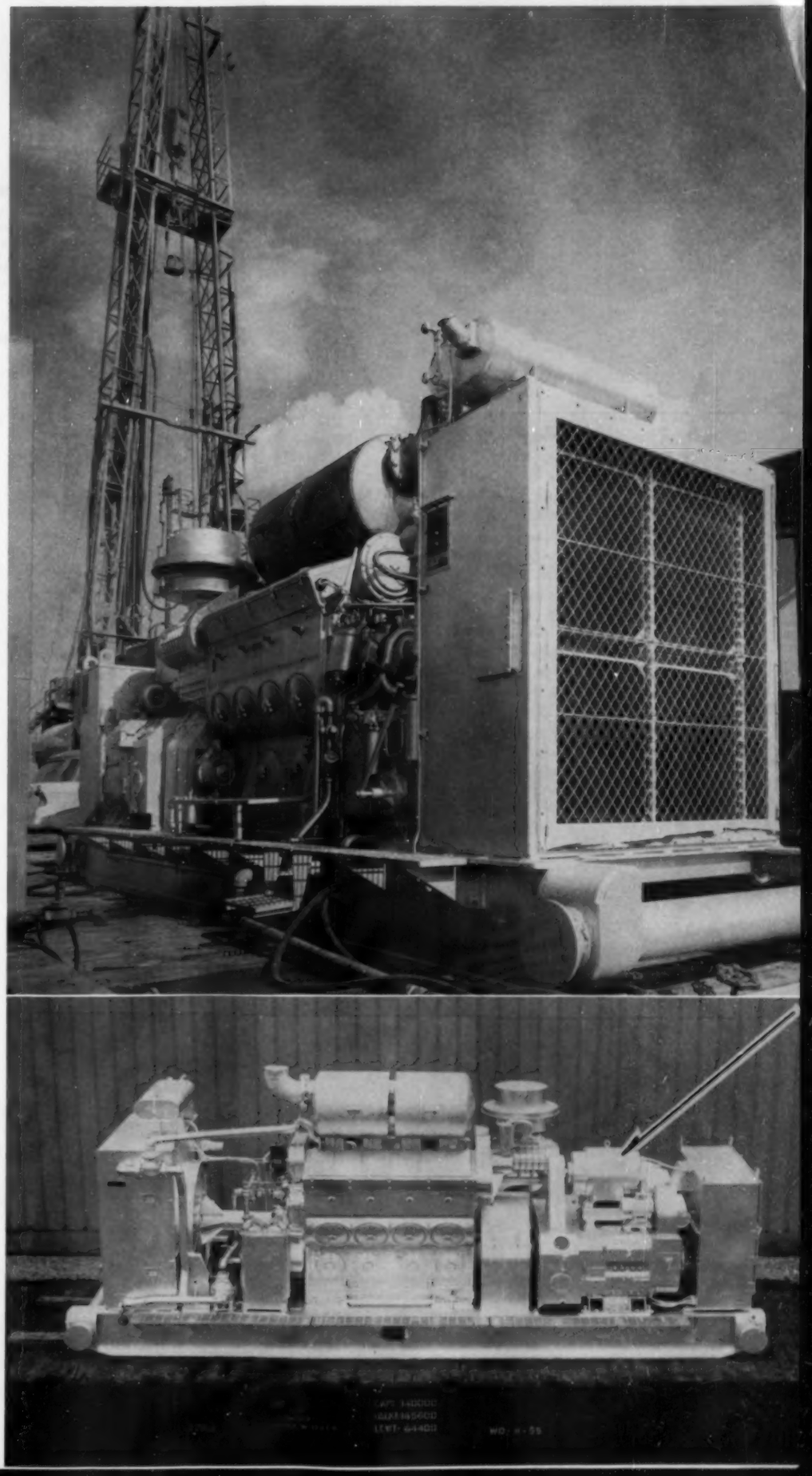
By W. L. BODE

A NEW and more powerful direct current, diesel-electric generating unit for oilwell drilling—completely self-sufficient with its own built-in alternating current generating system for auxiliary purposes—is announced by Electro-Motive Division of General Motors at La Grange, Ill. Electro-Motive, which first introduced a completely integrated, compact diesel-electric power system for drilling rigs in June, 1955, now offers a standardized, completely self-sufficient unit which is independent of any other source of electric power. Its own ac generator provides alternating current to the rig ac generating set.

"Since April, the prototype unit has undergone rugged field testing through the cooperation of the Sun Oil Company," said Nelson C. Dezendorf, vice president of General Motors and general manager of Electro-Motive Division. "The unit has been in service on Sun's Rig 15 near Rayne, Louisiana, where it has helped drill a 15,000 ft well."

The new unit, designated SR-10, is 2,000 lbs lighter in the air-cooled model. It is a more powerful unit than its predecessor with generator ratings up from 500 to 640 kw and motor hp increased from 625 to 800. Horsepower of the General Motors model 8-567CR engine has been increased to 1,000 continuous in the new unit. A load regulator automatically provides the load demand of the driller without overloading the engines. Thus, the engines can be loaded to their full ratings giving the contractor a good deal more useable power for his horsepower dollar.

"A number of other features have been designed into the equipment as a result of the experience gained from 21 Electro-Motive-powered drilling rigs currently operating in the Texas-Louisiana Gulf Coast area," Mr. Dezendorf pointed out. "These features include an advance design and simplified generator drive arrangement, elimination of rotary exciters with their attendant maintenance, newly designed engine accessory arrangement, heavier duty electrical control equipment, and re-designed control cabinets. The new model D-49 motor includes many engineering advancements such as improved insulation and incorporation of splash guards with horsepower rating increased from 625 to 800."



New diesel-electric generating unit for oilwell drilling is shown leaving plant of Electro-Motive Division of General Motors at La Grange, Ill., prior to field testing on Sun Oil Company Rig 15 near Rayne, Louisiana. Arrow points to alternating current generator, built in as integral part of unit to provide ac power for all auxiliaries making unit completely self-sufficient.

WHAT'S GOING ON IN ENGLAND

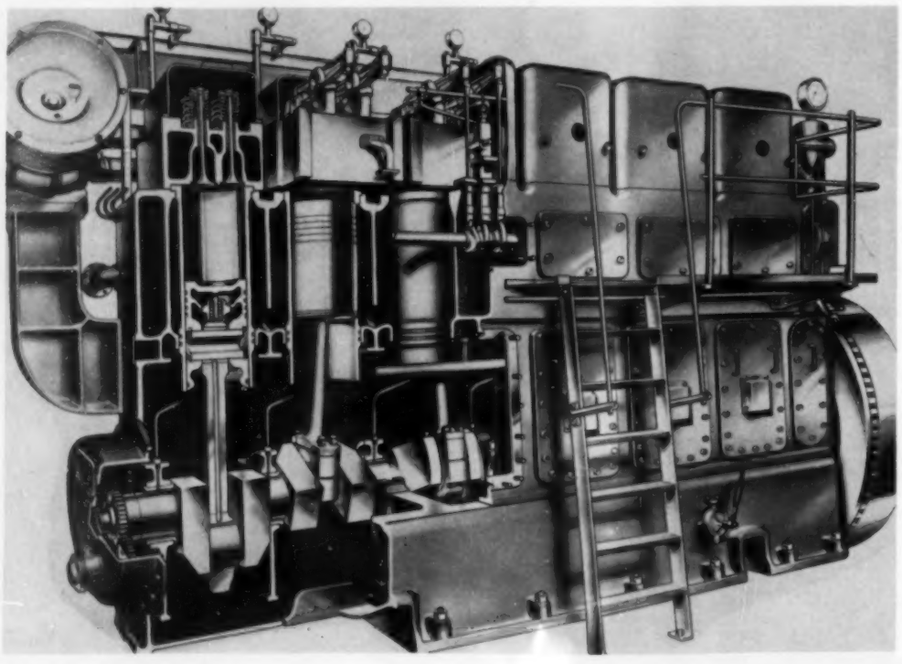
CONDUCTED BY **BERNARD W. LANSDOWNE**

Bernard W. Lansdowne is an associate member of the Institution of Mechanical Engineers and is widely known among British and European diesel manufacturers as a former editor of our English contemporary "Gas & Oil Power." His early workshop training was spread over seven years with A.E.C. Ltd., Southall, following which he served some five years with that company's sales engineering department. He is now specializing in industrial advertising with Roles & Parker, Ltd. in London.

A New English Electric Design

A COMPLETE redesign of their RL series of engines has been carried out by The English Electric Company Ltd., of Rugby. So drastic has this been that the only readily apparent points of similarity with their earlier RL type are the bore and stroke dimensions of 15 in. and 20 in. respectively. In its redesigned form the RL engine will now be available in units from five to nine cylinders either naturally-aspirated or turbocharged and with or without air cooling. It is also available in dual fuel form or suitable for service on heavy fuels of up to 950 secs. viscosity. The speed range is from 360 to 540 rpm except for the seven, eight and nine-cylinder designs which are intended for service at speeds up to 450 rpm. The power available varies from 683 to 2,890 bhp, the bmep figures being 85 lb per sq in. normally aspirated, 131 lb per sq in. turbocharged and 160 lb per sq in. turbocharged with intercooling. For service as a dual fuel unit a 5% ignition fuel quantity is used and in turbocharged form intercooling is always incorporated, the maximum rating for this type being 131 bmep.

The cast alloy iron bedplate incorporates integral ribbed diaphragms to carry the crankshaft journal bearings. On the top machined face of the bedplate there are oil drain grooves which discharge into portable receptacles. The main bearings are 12 in. diameter precision type steel backed and are lubricated and cooled from a high pressure oil bus-pipe carried in the crankcase. The lower halves of the shells can be rolled out for inspection without removing the crankshaft. The shaft itself is a one piece forging, with integral driving flange. The crankpins are 10½ in. diameter giving a good degree of overlap and generous journal and crankpin bearing areas. A stub shaft is mounted at the free end, to which the lubricating oil pump driving gear and overspeed governor are fitted. This stub shaft can be extended when required to provide a forward end drive of considerable power capacity. Provision is made for a torsional vibration damper or detuning flywheel when required. The crankwebs are drilled for lubricating oil transfer to the big-ends and are also drilled and tapped to suit a main bearing extraction tool. The crankcase is cast in one piece for five or six cylinder engines, and is cast in two pieces for seven, eight and nine cylinder engines. Large inspection doors are provided at the front and rear, giving access to the crankshaft journal, bearing caps, etc., connecting rod big ends and camshaft drive. The camshaft can be inspected while the engine is running.



The camshaft is assembled in separate sections, joined together by cuff couplings to permit camshaft withdrawal even where space is restricted; removal of the camshaft is further facilitated as it can be withdrawn from either end of the engine. It is carried in renewable bearing shells lined with white metal. The steel inlet and exhaust cams are in one piece, hardened and keyed to the shaft, fuel cams are in halves bolted together and dowelled to the shaft for angular location. Engine speed control is by centrifugal governor bevel gear driven, through a spring cushion coupling, from the flywheel end of the camshaft. A hand control is provided for fine speed adjustment, within plus and minus 5% of the engine speed, while the engine is running, and a remote electrically operated control is also provided for the same function. Cast alloy iron cylinder liners of the wet renewable type are used, adequate provision being made to accommodate liner axial expansion. For engines operating on heavy fuels special liners with chromium plated bores are available.

The individual, cast iron cylinder heads, each carry two air inlet valves of 3% nickel steel and two exhaust valves of heat resistant steel. Inlet and exhaust valve seats of Valmet 18% chrome iron are renewable, as also are the valve guides. Each head is fitted with a cylinder air starting valve (or a blank), a fuel injector, and a pressure relief valve with wear resisting seats and compression release screw. A feature of the design is that the heads can be removed without disturbing the air, water or exhaust manifolds. Lightweight, easily removed covers provide access to the valve gear. Each pair of valves is operated by a bridge piece, and a tappet screw adjustment is provided to compensate for unequal wear of the valve faces and seats. Tappet clearances are readily adjustable by means of a case-hardened steel ball housed in a socket at the

upper end of each short stiff push rod. Forced low pressure lubricating oil is applied to the rocker gear with oil flow to the valve gear adjustable by means of a restrictor on each rocker lever.

The trunk type pistons, cast in alloy iron, are oil cooled on the underside of the crown. Oil, from the engine high pressure system, is fed via the big end and drilled connecting rod to a spray piece, the oil impinging on to the underside of the piston crown which forms the roof of the piston cooling chamber. Cooling oil is returned to the sump through two stand pipes projecting from the base of the chamber. Pistons are machined with graduated cold clearances so that, when at working temperature, the bearing surfaces against the cylinder liner assume cylindrical form to provide ample bearing area. Four gas rings in special cast iron, and two oil control rings, one above the gudgeon pin and the other at the bottom of the piston skirt, are fitted to each piston. The palm end type connecting rods are manufactured from steel forgings and are drilled for lubricating to the gudgeon pins and piston cooling spray piece. The big end blocks are of the marine type, made from mild steel forgings, and carry four high tensile steel bolts. Provision is also made for clamping the big end halves so that the bearing need not be opened up when withdrawing a piston and con-rod. Each big end bearing carries a steel bearing shell and aluminum bronze liners.

The injection equipment is of C.A.V. or Bryce manufacture, each pump being fitted close to the cylinder it serves so that the pipes connecting the pumps to their injectors are of short and equal lengths. Water cooled fuel injectors for use in dual fuel engines or units running on furnace oil can be supplied to special order, and are interchangeable, in the heads, with the standard injectors. Engine starting is by compressed air on conventional lines. Engine pressure lubrication is provided by an integral gear type pump gear driven from the engine crankshaft at its free end. The engine is fitted with a hand operated lubricating oil priming pump, and a non-return valve fitted in the delivery pipe prevents high pressure oil affecting the pump. The exhaust gas turbocharger has its own integral lubrication system but uses the same grade of lubricating oil as the engine. HD30 grade is recommended. The engines are provided with extensive alarm equipment in the form of an overspeed governor, of the spring loaded fly-out type, fitted direct on the stub shaft extension of the crankshaft and arranged for engine shut down at 15% increase of normal running speed. They are also equipped with a low lubricating oil pressure device which automatically shuts down the engine, divorces it from the main busbars, and at the same time gives audible and visual warnings of the defect. The same conditions are created in the event of a high water temperature being set up in any engine. These are two of the many applications for which shut down and warning mechanisms are available. Engine crankcases are fitted with quick-acting explosion relief valves which reseat as soon as a pressure pulse has been relieved.

It's a good thing to have an extra big heat exchanger on the job and something else again to use it without an automatic temperature control valve in the system.

Another

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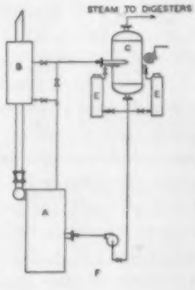

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GAS TURBINE PROGRESS

A COMMENTARY BY R. TOM SAWYER

R. Tom Sawyer's well known in the gas turbine field having been the first chairman (1944) (and now treasurer) of the Gas Turbine Power Division of ASME. He spent 7 years with G.E. Transportation Dept., and 26 years with American Locomotive, now Alco Products. At present he is a Consultant, including "Consultant to the Staff" of the Experimental Towing Tank at Stevens Institute of Technology. In addition to being a Fellow Member of ASME and AIEE, he is a member of SAE, ARS, ANS, IME in London, DEUA in London. He is also a member of Franklin Institute and a Professional Engineer. Mr. Sawyer is the author of *The Modern Gas Turbine* and *Gas Turbine Construction*, and co-author of *Applied Atomic Power*.

Applications For Smaller Gas Turbines

Dr. W. T. von der Nuell presented an unusually fine ASME paper on "Smaller Gas Turbines." Many charts and diagrams of various types of gas turbines are given. However one of the most interesting portions of his discussion was on APPLICATIONS.***

The fact that for the past few years gas turbines with up to around 300 hp output are being produced in volume clearly demonstrates their acceptance. The financing of the development of small gas turbines has found support from Air Force and Navy because this power plant is particularly well suited as a source of secondary aircraft power for electrical or hydraulic services, starting, pressurization, climatization, and the like, delivering useful output in the form of shaft power and of compressed warm air and/or hot gas. The compressed air is fed into air-cycle-climatization. Shaft power is needed for alternator and pump-drive means so that electrical and hydraulic energy are available without operating the main power plant. The gas-turbine type offering delivery of compressed air, if necessary with temperature selection, and, at the same time, shaft-power output has found good acceptance because of its adaptability to the demands. The success of these turbines is largely the result of the selection of components with broad operating capabilities and the perfection of automaticity of the control system, giving true pushbutton operation. Small gas turbines have been installed both in the aircraft and under it in so-called pods for take-off assistance or secondary power and on many airfields they are available in ground-support equipment: i.e., wherever the advantages of ease of starting, of light weight, small size, adaptability, independence from cooling water, and so on, really count, while fuel consumption, in fact, is of lesser importance. Thousands of these units are in daily operation and have justified themselves beyond question. As a matter of fact, even for the highly specialized purpose of just serving as a starter for large gas turbines, they are being used, for instance, on the 12,000 shp turbo prop engines powering the Russian long-range bomber *Bear*.

The large gas turbines for aircraft propulsion, of which approximately 100,000 units have been built in the United States of America alone after World War II, have progressed so well that now they have been accepted as the most promising power plant for new airliners. This, as well as the success of the small secondary power gas turbine, explains why smaller gas turbines are finding more and more application as prime movers for winged aircraft and helicopters and are being installed as take-off aid source of power for boundary layer control, and so on. While so far the aircraft-type gas turbines in production range from about 50 hp upwards, smaller units may well become of interest in conjunction with special projects. The desirability of a gas turbine below, say, 20 hp may be considered questionable. Unless unorthodox approaches are developed, the operation of such a small gas turbine to become a success is no picnic, although definitely not impossible especially if fuel consumption is rather insignificant. The pros and cons of small gas turbines for road vehicles have been debated at length in the press. Meanwhile, a number of financially strong manufacturers of reciprocating automotive engines have published early results of their activities in the development of gas turbines in the 100 to 500 hp class.

It is probably safe to agree with statements by others that the gas turbine will first be introduced in trucks and similar heavy duty equipment, although presently, no one will say when, "Such vehicles can be designed to exploit the full advantages of the turbine in its various configurations. These advantages include (a) reduction of weight and bulk (b) use of available low-cost fuels, (c) operation in any climate, and (d) low maintenance". Some day the event of producing gas turbines in "Detroit quantities" can be expected. In trying to assess the chances of the small gas turbine, the enthusiast cannot afford to ignore further progress in the development of reciprocating automative engines. If the same degree of optimism regarding further perfection is afforded both types, the future reciprocating engine for the automobile may give the competing small gas-turbine a hard run for the money. Too many intangibles make any clear-cut comparison presently impossible. Nevertheless, where true experience is available, such as the admirable record of the Rolls-Royce Dart gas-turbine in commercial airline service, the following statement cannot be overlooked. "The day-to-day inspection and maintenance of the gas turbine in military and in airline service absorbs far less man-hours than does piston engine inspection. Present day experience still confirms this. It is, therefore, fortunate that the gas turbine lends itself better to more rapid flight development and acceptance than the piston engine."

Naturally, to draw a fine line between small, medium, and large-size gas turbines is impossible, and there are applications where a size differentiation has little meaning. There are others where this kind of a prime mover, so flexible in design and arrangement can utilize widely different components enabling it to compete for almost every small prime-mover application. These features are attractive, and sometimes deceptive. The situation reminds one somewhat of reciprocating engines where who knows how many engines with wobble plates, sleeve mechanisms, and what have you have been invented all right but have found little practical application. Certain interesting possibilities may be worthy of a brief discussion. All-electrical transmissions are being used on diesel-electric locomotives and ships because they offer torque amplification without gears, braking capability, easy reversing, finely adjustable speed, agreeable acceleration characteristics, and eliminate drive shafts and related equipment. A more recent example for such a system was the Le Tourneau *Sno-Train*, which is powered by d-c motors driving from inside the rims through reduction gearing. Converters serve to use d-c motors on a-c power generation. Plainly, it suggests itself to consider a gas turbine as the prime mover of the a-c alternator or, in other words, a smaller and more compact electrical power package. For alternator drives, the so-called single or fixed-shaft gas turbine is quite suitable and has been shown to give satisfactory service in hundreds of lightweight a-c power sets,

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**The Garrett Corporation, Phoenix, Arizona.*

***Quoted from paper No. 57F13, Presented at Hartford, Conn. on September 23, 1957.*

a typical example being the GTP70 developed and manufactured by The Garrett Corporation and in service, in quantity, in Navy-assigned aircraft. Testing of small gas turbines with mechanical drive in a locomotive has produced promising results. For instance, the versatility offered through the utilization of existing gas producers of the turbine type was recently expressed as follows. "There is a great deal to be said for using high production-rate jet engines as replaceable short-life gas-producing sections and developing longer-life power turbines and gears for the output section. This approach is satisfactory, if the basic aircraft engine is reliable within its operating life at the derated naval rating. Engine development cost would also be a great deal less by using aircraft gas producers."

Small gas turbines are quite suitable for turbotype pumps such as widely used for irrigation purposes. Where smudging is required around citrus plantations the turbine exhaust may represent a good source of heat. Portable fire-pump sets, gas-turbine driven, have been introduced successfully. The hot exhaust gas from gas turbines has been found to offer excellent ice and snow-removal possibilities. Turbochargers of certain types now being produced in quantity have amazingly low price tags. Now add what is necessary to make such a turbocharger operate as a simple gas turbine without shaft-power demand. When produced in sufficient numbers and with the simplest solution for combustion chamber, fuel and oil pumping, and so on, the price scarcely can be expected to remain an obstacle against using such an utterly simple unit as a hot-gas producer. Operating with an air/fuel ratio above 70:1, the contents of burned gas in the air are so low that such a heater might well be acceptable for certain purposes. Especially if such a unit is hand-crank started and requires no battery and no electrical gadgetry, it could easily take over where heaters now used are useless because they depend on electrical energy. One can stretch the imagination still further. Such a unit conceivably can satisfy three purposes and offer an economical system when needed. (1.) It can preheat a reciprocating engine, or the engine compartment, before starting and then, directly or indirectly, serve as starting means. (2.) After the reciprocating engine is in operation, the compressor and turbine of this gas turbine can function as the engine's turbocharger bypassing the now unnecessary gas-turbine components. (3.) Supply power boost through additional burning in the gas turbine's combustion chamber within the temperature limitation of the turbine.

General Sales Manager

Harold C. Clark

The appointment of Harold C. Clark as General Sales Manager, Diesel Equipment, has been announced by the Curtiss-Wright Corporation's Utica-Bend subsidiary. Mr. Clark will direct the sales of the Mercedes-Benz diesel engine line, recently acquired by Curtiss-Wright. Mr. Clark comes to Curtiss-Wright from the Findlay Div. of Gar Wood Industries where he held the position of Sales Manager. He has had a great many years experience in the sales of heavy industrial equipment through previous associations with the Buffalo-Springfield Roller Co. and the Cleaver-Brooks Co. In his new position he will direct Mercedes-Benz diesel sales for all industrial applications and the entire marine industry. The Mercedes-Benz line offers a large selection of diesel engines, ranging from 19 to 3000 hp, designed for practically every power application. They have a low power-weight ratio and the Mercedes-Benz pre-combustion chamber, result of over 40 years of development and engineering.

South Africa Dealer Interested In More Agencies

The Marendaz Engineering Corporation Limited, P. O. Box Sir Lowry Pass, Cape Province, South Africa, is very much interested in arranging to sell in South and Central Africa a line of fairly small diesel engines made in this country. We would suggest if you are interested that you write to Mr. D. M. Marendaz, sending him full specifications, catalogs and prices because it takes a little time to get mail over there.

It might also be added that the Marendaz Engineering Corporation manufactures a line of slow speed diesel engines running from 6 to 16 hp in single-cylinder units (vertical) and 12 to 16 hp in two-cylinder units which they would like to distribute over here, so to you gentlemen who would be interested in representing the sale of comparatively small one and two cylinder engines made in South Africa, be sure to write them.

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Cummins Appointments

Charles E. Martin

Paul J. Every

Paul J. Every has been appointed Managing Director of the Cummins Engine Company, Inc. subsidiary in Shotts, Lanarkshire, Scotland and has left to take over his new duties. Mr. Every had been the Cummins general sales manager at the parent plant at Columbus, Indiana, before being appointed to his new position in Scotland. He joined Cummins ten years ago after being employed by Baldwin Locomotive, Philadelphia. At the Shotts plant, Cummins is manufacturing a wide range of high speed, high horsepower diesel engines in the 200 to 335 hp range for use in earth moving equipment, industrial units, rail cars and marine units. Cummins Engine Company, Inc. announced formation of the United Kingdom subsidiary in October of 1956 and engines have been in production since last May. Mr. Every succeeds D. J. Cummins as Managing Director of the Shotts operation. Mr. Cummins returns to devote his full time to his responsibilities as Vice President—Engineering.

Appointment of Charles E. Martin as general service manager and member of the executive committee of the Cummins Engine Company, Inc. of Columbus, Indiana, has been announced by Company President, R. E. Huthsteiner. As general service manager, Mr. Martin assumes overall responsibilities for the Service Division of the Company. He succeeds H. E. Bollwinkel, who resigned. Mr. Martin joined the Cummins Company in 1943 and has been employed in the Sales and Service divisions of the Company. Prior to his appointment to his new post, he was manager—Field Service. He holds a bachelor of science degree from Purdue University.

Twin Disc Research Lab

Completion of a new and modern research laboratory at Rockford had been announced by Twin Disc Clutch Company's Hydraulic Division, Rockford, Illinois. The new laboratory is housed in a brick building having approximately 12,800 sq ft of floor space. Test equipment currently occupies 8580 sq ft, with the balance available for future requirements. The entire facilities are being utilized in the study of fundamental functions of clutches and clutch components as well as the working fluids used in fluid couplings and hydraulic torque converters. Hydrodynamic tests such as blade stage cascades, hydro tunnels and flow research are held in a laboratory room completely enclosed and isolated from the rest of the facilities. One test bay is designated entirely for small special tests on heat cycle runs, governors,

Diesel and clutch research bay at new lab.

bearings and similar devices. Another bay is devoted to clutch research and seal testing. The seal testing machine contains a series of rotating heads where seals may be subjected to any desired conditions for extended periods.

Previous Rockford laboratory facilities included a 300-hp dc dynamometer, which is still in use. As the part of the research facilities, however, a new 1000-hp ac dynamometer has been installed. This dynamometer will absorb up to 20,000 lb-ft of torque at zero rpm. The 1000-hp dynamometer accomplishes three purposes: (1) it delivers higher power to test units than previously possible; (2) it gives previously obtained data in much less time; and (3) it gives data never before possible. Future laboratory expansion will include the use of curve followers, which will cause the input characteristics of the dynamometer to appear to be customer's engine and will exactly duplicate the torque curve of the engine. Curve followers will also be used to provide output characteristics that will exactly duplicate the load characteristics of a field application.

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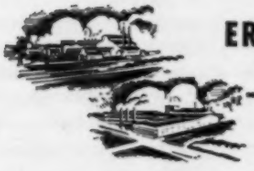

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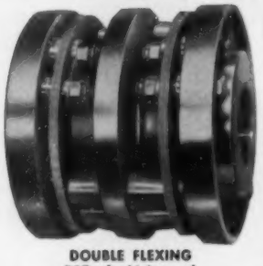

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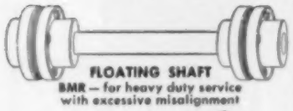

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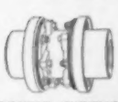

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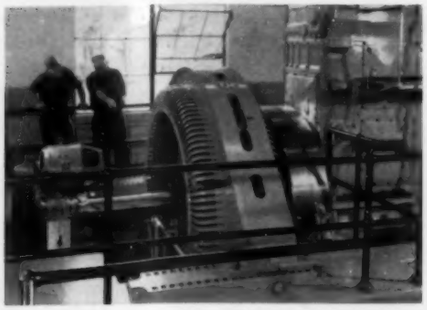
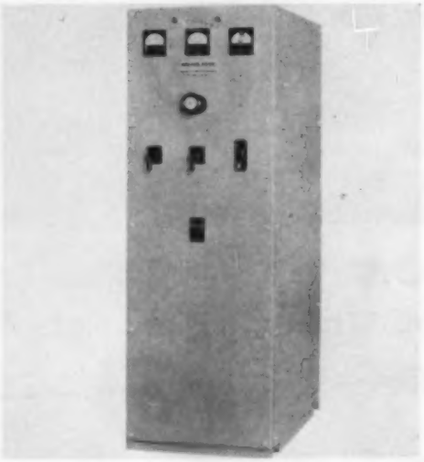
Generator Purchased



The Municipal Power & Light Plant, Princeton, Minnesota has purchased and installed an additional diesel generator unit. The generator is rated at 1250 kva, 360 rpm, 2400 volts, and was manufactured by Electric Machinery Mfg. Co. The generator is driven by a White Superior diesel engine. Princeton purchases most of its power from the area REA system. The Princeton plant is used primarily for peaking and standby service. This latest addition in its generating capacity brings installed capacity up to 2040 kw.

Diesel Generator Control



A compactly designed, floor-mounted diesel generator control cabinet in the low voltage range of 35 to 250 kw, 480 volts, is announced by Lake Shore Electric Corporation, Bedford, Ohio. For use with both single unit standby installations and multiple generator parallel service, the new cab occupies only 5 sq ft of floor space and is designed to fit modularly with standard switchboard panels. Instrumentation includes large 4-inch full-view voltmeter and ac ammeter with switch, 50 or 60 cycle vibrating reed-type frequency meter, field rheostat, and voltage regulator switch. Meters are conveniently located at eye level, and the panel is equipped with instrument lights. Molded case circuit breaker, voltage regulator and transformer equipment are located in the center section and employ separate harness wiring for servicing convenience. Depending upon generator power characteristics, the cabinet is equipped with one of the following voltage regulators as standard, Regohm No. 3 or 4; Simplex or Electric Machinery. Space is provided in bottom section for distribution, generator start control, battery charger, etc.

The floor mount control is suitable for parallel service installations for capacities to 2000 amps on the bus bar. The unit requires manual operation to parallel generator to the line and to throw the breaker in. The manufacturer points out that the control is useful in small power stations of multiple-set design where only one of several generators is needed to satisfy demand during light load periods. The control due to its low cost is ideal also for single set installations where future growth will require added sets in parallel. For parallel service the control can be supplied with a swing panel equipped with synchronizing lights, synchroscope, and bus voltmeter. A protective reverse-current relay is used to throw out control circuit breakers on the line when one set is started to prevent generator feed back. Wiring is done with No. 12 stranded thermo-plastic insulated wire, employing number-coded leads. Harnesses are tied and taped, presenting an orderly, easily serviced layout. The cabinet is of 11-gauge steel construction with front, side and top panels fastened with 3/8 in. cap screws. Use of bolted fabrication is said to provide a rigid cabinet with considerable savings obtained by eliminating weldments. Cabinets are provided in a standard instrument gray baked enamel finish. A hinged pan-type instrument panel is offered as optional equipment. Also available to order are kilowatt meter, governor control switch, synchronizing lights and sync. switch with removable handle, cross-current compensation, field discharge switch and resistor, convenience outlets, combination frequency and elapsed time meter. Further information is available from the Lake Shore Electric Corporation, 202 Willis Street, Bedford, Ohio. (ITS NEW)

Bernsen Appointed Sales Manager of Engine Life

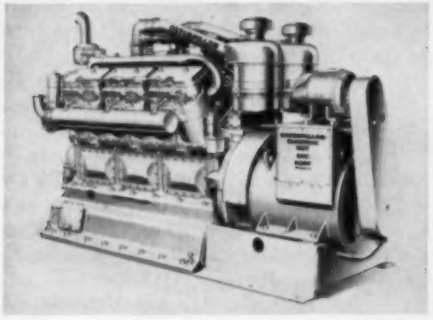
William V. Bernsen

William V. Bernsen assumed new duties recently as sales manager for Engine Life Products Corporation, according to joint announcement by W. R. Fuller, president, and John Reinshagen, general manager. Engine Life, with factory and main offices at El Monte, Calif., is well-known as a manufacturer and developer of lubrication and fuel oil filtration.

Bernsen, who comes to the company with many years of experience in the lubrication field, studied business administration at Northwestern University in Chicago and engineering at the University of California at Los Angeles. Prior to World War II Bernsen was with the Standard Oil Company of Indiana for 14 years and after serving with the paratroop division in the European theatre during the war, he came to California and was sales manager of the industrial division of Luber-finer Corporation. He later became associated with Miller-Joyce Company, manufacturers' representatives, where he organized and administered the H/C filtration division. He has been active in the fluorocarbons industry for the past two years. Instrumental in setting up a filtration symposium at the University of California at Los Angeles, Bernsen also helped organize a curriculum of courses

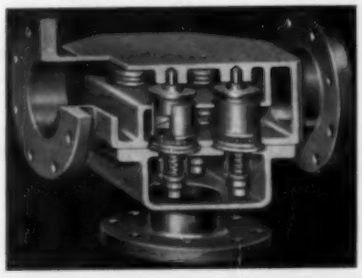
in lubrication which are now an active part of UCLA's engineering school. He has been active in the American Society of Lubrication Engineers for the past seven years.

Spark Ignition Electric Set



A new electric set, combining high output and compactness, has been introduced in the form of the Cat D397 Spark-Ignition Electric Set, according to a current announcement by Caterpillar Tractor Co. Available with either the new SRCV Cat Generator or an optional two-bearing generator, the new electric set is rated at 250 kw. Power for the Spark-Ignition Electric Set is provided by the V-type, D397 diesel engine, equipped with simple alterations for fuel carburetion and magneto ignition system, allowing the set to operate on methane, butane, propane or field gases. The safe, low-tension distribution system for ignition used in the new power unit provides a hot, positive spark in the cylinder. A magneto supplies low-tension voltage to high-tension transformers located near each cylinder. Short, high-voltage leads prevent leakage, arcing and current loss. The Caterpillar D397 Spark-Ignition Electric Set is available with either of two engine compression ratios—10:1 for use with methane gases, or 7.5:1 for butane, propane or field gases. It also may be easily converted for diesel operation, whenever necessary.

Compactness of the unit is provided by use of a top-mounted exciter and a single, heavy-duty bearing on the new Cat SRCV generator. A flex-plate coupling to the engine flywheel further eliminates a front bearing and simplifies alignment. The set's self-regulated, constant-voltage generator produces 60-cycle three-phase current at a choice of 240, 480 or 2400 volts at 1200 rpm. Electric sets generating 50-cycle current are also available on special order. To provide easy operation and maintenance of the new generator, the regulator is designed with no moving parts, needing no adjustment after initial setting. Voltage is adjustable from 5 per cent above to 10 per cent below nominal voltage. Since the engine is equipped with a Woodward isochronous governor, regulation may be held at zero variation. For parallel operation with other current sources, voltage droop is adjustable. Air, direct electric or gasoline engine starting systems are available with the Cat D397 Spark-Ignition Electric Set. The engine instrument panel includes fuel pressure, oil pressure and water temperature gauges, and the electric set is mounted on a standard D397 Electric Set base. The engine arrangement includes oil bath air cleaners and shut-offs for overspeed and low oil pressure. (ITS NEW)



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JACKET WATER & LUBE OIL THERMOSTATS

SAFETY Provided for by multiple independent elements as shown above.

✓ Provided for by rugged AMOT element construction. No AMOT element has ever stuck closed since its introduction 6 years ago. Many years of "know how" are built into every AMOT element.

✓ Omission of all hand operators means engine temperature is safe from tampering by engine attendants. AMOT is the only engine thermostat that can be considered safe without a hand operator.

✓ Lack of capillary tubes, bulbs, and packing glands means no failures from kinks or leaks.

SERVICE There is only one replacement part—the element. Renewal of element renews all working parts. Element replacement, if ever required, is several times faster than on any competitive make. Original accuracy of temperature setting is always provided in element replacement.

✓ AMOT engineers are available in most major cities to help on application and other problems.

✓ Most models are available from stock for rush orders.

MODELS ½" to 6" pipe sizes. Larger sizes in iron, bronze or ductile iron.

AMOT CONTROLS CORPORATION • FIRST ST. & NEVIN AVE. RICHMOND, CALIFORNIA

MANUFACTURERS OF QUALITY ENGINE THERMOSTATS & SAFETY CONTROLS

Warm up cold motors *FAST!*

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SUREFIRE

MOTOR STARTING FLUID

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*Starts Any Gas or Diesel Engine, with TLC**

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That's right! The new, patented, low-ether formula SUREFIRE is safe... protects your engine against expensive upper cylinder damage and reduces engine wear by eliminating slow, hard starts all year 'round. The cheapest engine starting insurance you can buy. Tested and approved by major oil companies. Approved by NYC Fire Dept. Meets all ICC requirements. SureFire Starter Sprayer is available for easy application of bulk fluid.

- ✓ Prolongs battery and starter life
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- ✓ Reduces maintenance cost
- ✓ Operates to 65° below zero

Handy 11-oz. Pushbutton Can

Double-your-money-back guarantee. Sold at all leading automotive, construction equipment and mill supply dealers. Try it today.

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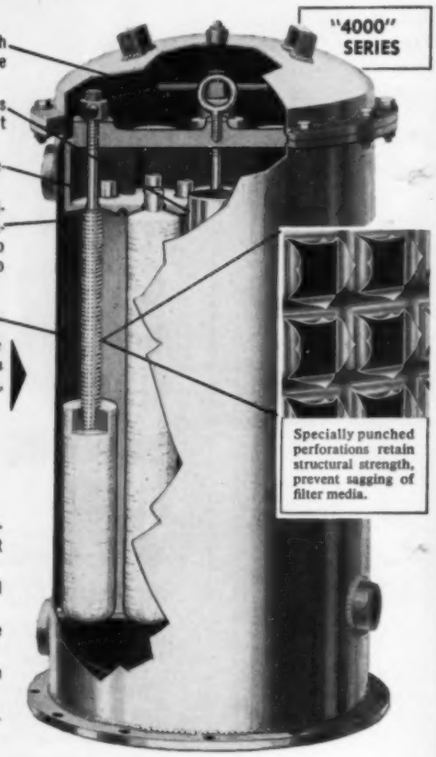
THE PROBLEM: "Heavy duty filtration to your specification"

THE ANSWER: "ENGINE LIFE Maxiflo '4000' SERIES OF FULLY ENCASED, MULTIPLE FILTER SYSTEMS!"

Replaceable Element Filtration For Marine, Diesel and Natural Gas Engines In:

HEAVY INDUSTRY (Pipelines & Power Plants)
CONSTRUCTION (Heavy Earth-Moving Equipment)
MARINE ENGINES • STATIONARY ENGINES

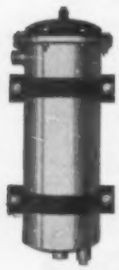


- Elements uniformly compressed with wing-nut bolts. This reduces service cost factor.
- Neoprene "O" Ring Seal insures perfect seal, eliminates gasket replacement.
- Cast aluminum manifold for ideal element compression.
- Piston type bypass valves do not orifice when open, valves face downward so abrasives will not adhere to piston and be flushed back into engine.
- Heavy welded steel construction.

Maxiflo non-corrosive metal cores handle up to ten times normal running volume, give solid vertical support.

MODERN FUEL CONDITIONING THROUGH Maxiflo "4000" FULL FLOW SYSTEMS

- Condition viscous lube oil and fuel.
- Remove, neutralize acid without using chemicals.
- Trap abrasives: carbon, dust, metal particles.
- Meet today's supercharged engine requirements.
- Give maximum oil flow, minimum pressure loss.
- Repel moisture on element surface.



Maxiflo "3000" SERIES *Ratio-rated for:*

OIL DRILLING RIG ENGINES • PUMPING ENGINES • TRUCKS • MARINE ENGINES (light) • CONSTRUCTION (Euclid trucks, shovels, etc.)

For moderately heavy duty installations, the Maxiflo "3000" Series offer the same consistent performance as the "4000" Series.

FOR BOTH Maxiflo "4000" AND "3000" COMPLETE DIMENSION DRAWINGS AND SPECIFICATIONS FURNISHED ON REQUEST

A Comprehensive Line of Filters and Replacement Elements

ENGINE LIFE PRODUCTS CORPORATION

EL MONTE, CALIFORNIA

ENGINEERED FILTRATION SERVICE

INDUSTRIAL AUTOMOTIVE MARINE & AGRICULTURAL

Michigan-Ohio News

By **Jim Brown**

AN International model TD-14 crawler with a model 14D-2 hydraulic bulldozer blade has recently been delivered to Orville B. Oard of Gladwin, Michigan. The sale was made by the Grand Rapids branch of Wolverine Tractor and Equipment Company.

CUMMINS Diesel Michigan, Inc. has installed a 175 hp model JT-6-B Cummins diesel in an F-800 Ford truck for Mr. Thane Tanner of Barryton, Michigan. Mr. Tanner will break in the new Cummins diesel hauling autos between Detroit and the West coast.

CYRIL J. Burke, Incorporated, of Detroit has recently delivered a model 95 Northwest shovel powered by a Murphy diesel to Lewis and Frisinger of Ann Arbor, Michigan.

A. SALAVATORE Excavating of St. Clair Shores has a new Allis Chalmers model HD6G tractor-shovel. The machine was delivered by Earle Equipment Co. of Detroit.

LIVINGSTON County Road Commission located in Howell, Michigan has recently purchased an Austin-Western Super 99 grader equipped with a 4-71 GM Detroit Diesel. The grader was purchased from the R. G. Moeller Co. of Detroit.

BLOUW Excavating Company of Grand Rapids, Mich. has taken delivery on an International TD-9 crawler tractor. Equipped with a hydraulic bulldozer, the new tractor was purchased from the Grand Rapids branch of Wolverine Tractor and Equipment Company.

A MODEL JT-6-B Cummins diesel has recently been installed by Cummins Diesel Michigan, Inc. in an International CO195 truck for Mr. Vernon L. Hunter of Lowell, Michigan.

MICHIGAN Consolidated Gas Company recently took delivery on an Oliver 88 Hydro Trencher, equipped with a Hercules diesel engine. The sale was made by Cyril J. Burke, Incorporated, of Detroit.

SIX Allis Chalmers model HD21A crawlers with cable bulldozers were purchased this fall by Louis Garavaglia of Detroit. The new dozers were purchased from Earle Equipment Co. of Detroit and are now working on the Illinois-Indiana Expressway near Elgin, Illinois.

MR. R. L. COOPER of Winifrede, W. Va. has accepted delivery on a model 4028-C GM Detroit Diesel engine. The new diesel was sold by Ray C. Call, Inc. of Steubenville, Ohio and will be used on a saw mill operation.

A MODEL HOD Hough Payloader equipped with a 2½-yd bucket has recently been delivered to Wallace Stone Co. of Bayport, Michigan by Wolverine Tractor and Equipment Co. of Detroit and Grand Rapids.

CUMMINS Diesel has recently established a number of new maintenance dealers in the Michigan-Ohio area. The new dealers authorized to service Cummins diesels and stock parts are as follows: D. & T. White Truck Sales, Inc., Lansing, Mich. N. & K. Service & Parts Co., Muskegon, Mich. Crookston White Truck Co., Kalamazoo, Mich. International Harvester Factory Branch, Detroit, Toledo Truck Sales and Service Co., Toledo, Ohio, Fremont White Truck Sales & Service, Fremont, Ohio.

CYRIL J. Burke, Inc., of Detroit has delivered an Oliver model OC-12 bulldozer powered by a 6-cylinder Hercules diesel engine to Paul DeGrandchamp of Detroit.

THE W. H. Knapp Company located in Monroe, Mich. recently purchased a 3¼-yd model 250 Pettibone Mulliken Loader from Cyril J. Burke, Inc. of Detroit. Powered by a GM Detroit Diesel engine, the new loader will be used to push scrapers, load equipment, bulldoze and as an all-around paving tool.

THE Redford Excavating Co. of Detroit has a new model HD6G Allis Chalmers Tractomotive loader. The loader was purchased from Earle Equipment Co. of Detroit and will be broken in on a housing project.

A. H. PROKSCH Const. Co. of Iron River, Michigan has accepted delivery of a 2-yd Michigan model 125A tractor-shovel. The new tractor-shovel is powered by a GM 3-71 diesel engine and was sold by Lake Shore, Inc. of Iron Mountain, Michigan.

AN International TD-24 crawler with a hydraulic bulldozer blade was purchased by William J. Muehlenbeck of Saginaw, Michigan. The sale was made by Wolverine Tractor & Equipment Company.

MR. TONY VOLPE of Detroit has purchased a model NH-6-B Cummins from Cummins Diesel Michigan, Inc. to install in an Autocar.

SEYMOUR Weissman of Detroit has recently accepted delivery on his 15th Northwest shovel. This was a model 41, equipped with a Murphy diesel, and delivered by Cyril J. Burke Incorporated, of Detroit.

A. BRUCE and Sons of Livonia, Michigan has purchased an Allis Chalmers model HD6B crawler equipped with a hydraulic dozer blade. The new crawler was sold by Earle Equipment Company of Detroit and is working on a housing project in Livonia.

TWO Allis Chalmers model HD21G tractors with front-end loaders and 4-yard buckets have recently been delivered to the Great Lakes Steel Corp. of Ecorse, Michigan. The sale was made by Earle Equipment Co., of Detroit.

A 1-yd model LS-98 Link Belt trench hoe powered by a GM 4030C Detroit Diesel was sold to George R. Oberer Const. Co. of Dayton, Ohio by the Flack Equipment Co., also located in Dayton.

THE City of Grand Rapids, Michigan has purchased a model TD-14 International tractor equipped with a bull-grader blade. The sale was made by the Grand Rapids branch of Wolverine Tractor and Equipment Co.

D. & T. WHITE Truck Sales, Inc., a new dealer for Cummins in Lansing, Michigan has installed a model NH-6-B Cummins diesel in a model LJ Mack truck. The installation work was done for Farmers Petroleum Cooperative, Inc. of Lansing, Mich.

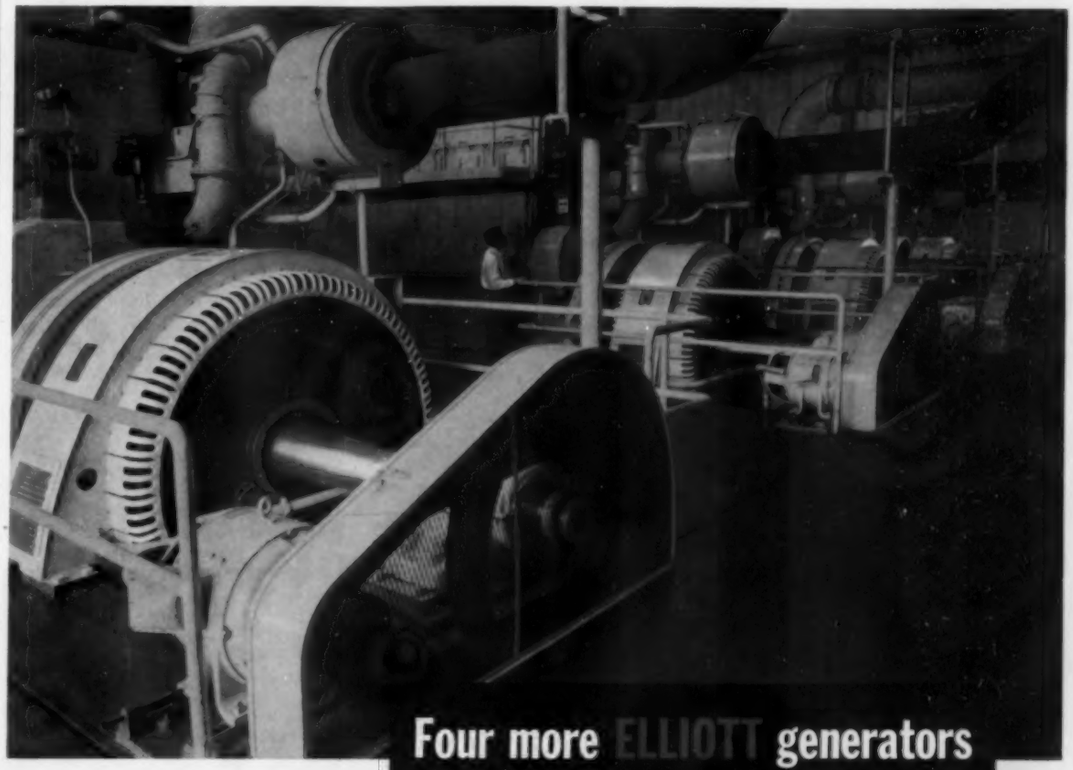
Miehle-Dexter Appoints Dr. K. C. Karde

Mr. Hans Bohuslav, General Manager of the Miehle-Dexter Supercharger Division of Miehle-Goss-Dexter, Inc., announces the appointment of Dr. Klaus C. Karde to a newly established position as director of engineering, research and development. The Miehle-Dexter Division produces a comprehensive line of rotary positive displacement industrial blowers and superchargers, and is actively engaged in the development of a new design of turbocharger. Prior to assuming his new duties, Dr. Karde was Manager of Research and Development of P&H Diesel Engine Division of the Harnischfeger Corporation. His responsibilities at that time included basic production models, their further development and development of new engine models.

Dealer Service Shop

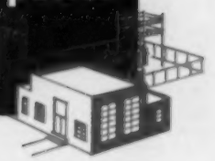
Cummins Sales & Service, Inc., Fort Worth, Texas, has increased to sixteen the number of factory-type maintenance shops it operates in the six-state mid-continent area with the recent opening of complete sales and service facilities in Farmington, New Mexico. The new shop will specialize in servicing the Cummins diesel and Turbodiesel engines powering drilling rigs and well service trailers in the San Juan Basin and Four Corners area. It is the first Cummins Sales & Service, Inc., branch to be opened west of Odessa, Texas, and the first shop in New Mexico, although the company previously had a sales representative at Farmington and currently has one at Hobbs. The new oil field sales and service facility at Farmington is conveniently located at the intersection of Sullivan and Mojave Streets, just a block off U.S. Highway 550 East, main route east and north out of Farmington. Because of the vast storehouse of natural resources that lie in the San Juan Basin, Farmington has become an important factor in the fast-moving oil, natural gas, and uranium industries. District Manager L. C. Hardin, with 12 years of service with Cummins Sales & Service, Inc., heads personnel at Farmington.

NOW AVAILABLE! The Brand New **DIESEL ENGINE CATALOG,** Volume 22. This giant, 400 page, 10½" x 13½", fully illustrated reference book containing complete and detailed engine and accessory sections is the biggest and best yet. Mail orders are now being filled for this "Bible of the Industry," which has been revised, rewritten and brought up to date completely from cover to cover. Send your order in now for this limited edition, which costs $10 postpaid plus California sales tax where applicable. Send checks or company orders to **DIESEL PROGRESS,** 816 N. La Cienega Blvd., Los Angeles 46, Calif.



These four Elliott 1583-kva, 327-rpm generators are driven by dual-fuel diesel engines. The diesels are also equipped with Elliott turbochargers.

Four more ELLIOTT generators help provide dependable power for RURAL AMERICA!



Over and over again, users of Elliott generators discover that Elliott-engineered machines "pay off" in trouble-free, continuous, performance—and in worthwhile economies, initially and annually. These four Elliott generators—serving the Federated Rural Electric Association at Jackson, Minnesota since 1949—are good examples of this economy and long-term dependability.

The outstanding performance record of Elliott generators—over the years—is the result of superior design and good workmanship. Electrically-welded fabricated steel parts, sturdy coil construction and extra bracing of windings provide high mechanical strength. Extra taping and insulating of stator coils assure positive moisture protection.

In fact, sound engineering and careful construction *throughout* insures the desirable continuity of electric generation, without costly breakdowns. And the Elliott design permits easy accessibility for routine cleaning and maintenance.

Ask for Bulletin PB 1400-3

ELLIOTT Company
Ridgway Plant, Ridgway, Pa.

87-16

Mid-West Diesel News

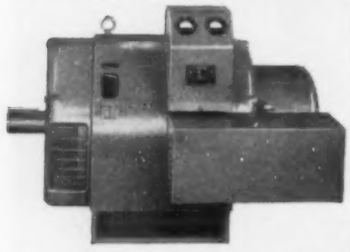
By L. H. Houck

RENO Construction Co., Olathe, Kan., has a pair of 6-71 GM diesels, twinned through an Allison torque converter, driving the Cedar Rapids rock crusher secondary on the Bagnell Dam relocation on U.S. 54 in the Missouri Ozarks.

Get the latest!

A COMPLETELY NEW "PACKAGED" GENERATOR

AMP-PAK



AMP-PAK Generator shown is rated at 187 kva, 1200 rpm, 240/480 volts. AMP-PAK is available in ratings of 75 thru 187 kva at 1800 rpm and 62½ thru 187 kva at 1200 rpm. Three phase, 80% PF, 60 cycles, 50C rise, and 120/208, 240 and 480 volts.

No exciter . . . No moving parts in the voltage regulator

AMP-PAK is a compact, revolving field a-c generator with built-in, static excitation system; static voltage regulator; and basic metering and controls conveniently grouped. AMP-PAK is a portable unit, factory assembled, internally connected, and tested.

No rotating exciter to maintain. D-C excitation is provided by a heavy duty, long-life, static rectifier.

No tubes, relays, vibrators to service. Voltage is regulated by a static, E-M-developed sensing circuit and "magical" magnetic amplifiers.

Holds voltage "rock-steady" so your motors, lights, and electronic equipment will work better. The static regulator provides ±2% regulation.

Starts big motors. A special, built-in voltage booster transformer stands by to reinforce line voltage when heavy loads are suddenly applied.

Easy to install. Needs no switchboard. Just connect load to AMP-PAK thru a suitable line switch.

Simple to operate. Has no belts, no "tricky" commutator, no adjustments — anyone can operate AMP-PAK.

See your nearest E-M Sales Engineer and write the factory for publication PRD-236.

E-M

ELECTRIC MACHINERY MFG. COMPANY
Minneapolis 13, Minnesota

Largest manufacturer of "Packaged" Generators

2100-TPA-2154

AAA ENGINE & Electric, Inc., Kansas City, Kan., recently delivered an XAH Waukesha gas engine to Ernst Development Co., of Kansas City, for oil field pumping. Sale was made by W. I. Wilhite.

AN Allis-Chalmers HD-16 crawler went to Millard Tripp, Dexter, Mo., for general contracting work, from Ryan Equipment Co., Sikeston, Mo.

SANITARY Bottling Co., Williamson, W. Va., is using a new Mack tractor with Mack Thermodyne diesel engine with Trailmobile trailer for delivery of their products on interstate routes.

MERTENS Bros., Williamsburg, Mo., and Lynn Hanson, Bowling Green, have taken delivery on an Allis-Chalmers HD-11 and an HD-15 with dozer, from Cooke Sales and Service, Fulton, Mo.

OWENS PRODUCE Co., Bentonville, Ark., has purchased four Mack diesels, all with the B-61 Thermodyne engine, from Skelton Motor Co., Mack dealers in Springdale, Ark.

SKELTON BROS., Springdale, Ark., now have six new model Mack B-61 Thermodyne tractors on their milk run from Springdale to Dallas, Tex. Milk is hauled in insulated tank trailers.

COOKE Sales and Service, Fulton, delivered an Allis-Chalmers HD-16 to Francis Graves, Owensville, Mo., to be used in a clay mine operation.

CALUMET Paving Co., Zionsville, Ind., has repowered a 15½ yd Euclid dump with a 279 hp General Motors 110 diesel. Reid-Holcomb Co., Inc., Indianapolis, made the delivery.

ASSOCIATED Produce Co., Springdale, Ark., have added two Mack B-61 Thermodyne diesel tractors to their fleet which now includes 8 units of this type. Purchases were made from Springdale Mack dealer, Skelton Motor Co.

RYAN EQUIPMENT Co., Sikeston, Mo., branch, delivered an Allis-Chalmers AC-45 motor grader to the Gray Ridge Special Road District, Gray Ridge, Mo. Unit has the new Buda division diesel power plant.

PICKRELL Drilling Co., Wichita, Kan., has purchased a GM diesel from Diesel Equipment Co., Inc., Wichita and Great Bend, for installation in a drilling rig.

NEW Oliver 990 6.7 cu yd scraper with Oliver diesel engine is being distributed in the Middle West by Standard Equipment & Supply Co., N. Little Rock, Mid-Western Engine & Equipment Co., Inc., Tulsa.

NEW AUTOCAR dump truck handles 27 cu yds; for off-highway work it is powered with a 600 hp Cummins V-type turbocharged 12-cyl. diesel. It has Fuller mechanical transmission with 9 forward and 2 reverse speeds.

CLINE Distributing Co., distributors of Falls City Beer, Mabscot, W. Va., is using Mack diesel tractors for its trailers.

M-R-S Mfg. Co., Flora, Miss., announce 4-wheel drive for its 335 hp Cummins diesel powered Model 200. The unit is recommended as a prime mover for self-load scrapers up to 20 cu yds and for scrapers up to 30 cu yds when assisted by push-loading.

JOHN DEERE 820 diesel tractors are proving popular in the Middle West for farm terracing jobs. Most of the owners use this rubber-tired unit with a Hancock scraper which is available in 5 cu yd size. Farmers in the corner of Nebraska report moving dirt for as little as three cents a cubic yard.

RINGSBY Truck Lines will soon have 30 Peterbilt dromedary tractors in operation with two front axles, both steering, front and rear air suspension and mid-ship mounted 250 hp Cummins diesels.

DENVER-CHICAGO Trucking Co., has added 15 Western type COE International tractors with Cummins diesels. Sleeper cabs with tilt and 2-speed tandem axles are features of the units.

SILVER FLEET Motor Express, Louisville, Ky., has added 82 short wheelbase White and White Freightliner tractors, all with Cummins diesels.

Rockwell Buys German Diesel Manufacturer

Rockwell Manufacturing Company has acquired Ilo-Werke, G. m. b. H., a West German manufacturer of two-cycle, air-cooled diesel and gasoline engines, Wil-

SERVICE-- EVERYWHERE

More than one hundred Quincy Authorized Service Depots throughout the country carry adequate stocks of genuine factory parts for all models of Quincy Compressors. So wherever you are, you know you can put extra confidence in your Quincy Compressors. They're built to give you the kind of service needed for jobs like diesel starting, operating air tools and controls — designed to stand up under rugged field conditions. Depend on Quincy Compressors and Quincy service for all your needs from 1 to 90 CFM. Write Dept. K-58 for catalog today.

Quincy COMPRESSORS

FOR LOW COST AIR POWER

QUINCY COMPRESSOR CO., QUINCY, ILLINOIS

lard F. Rockwell, Jr., president, announced recently. The engines are used largely in industrial applications for providing motive power for agricultural implements, portable sprayers, construction equipment, concrete mixers, refrigeration and air compressors. Other products made in smaller quantities include flow-type and centrifugal transmissions, large outboard motors, a single-wheel railroad car, shunter and starter sets for industrial engines in cold climates.

Mr. Rockwell made the announcement on his return from a 10-day trip to West Germany to review his company's sales program in that country and to discuss with Ilo-Werke officials how the new company will fit in with Rockwell operations. He was accompanied by Lloyd A. Dixon, executive vice president. Ilo-Werke, Mr. Rockwell pointed out, is Rockwell's first wholly-owned manufacturing subsidiary in Europe, and the purchase represents an initial investment in excess of $2 million in cash. The German company has its headquarters and principal factory in Pinneburg near Hamburg and also operates a plant at Munich. The two provide a total of approximately 215,000 sq ft of manufacturing space manned by approximately 1200 employees. Ilo-Werke management, headed by Heinrich Christiansen as president, will remain the same, Mr. Rockwell said.

The chief reason for the purchase, Mr. Rockwell said, was to protect his company's current European markets in the face of the approaching European Common Market and Free Trade Area and to insure expansion of these markets in the future. "The Common Market and Free Trade Area plans," he said, "are designed to establish a 12-nation trade area with a combined population of more than 240 million people—a trade area in which all internal tariff barriers will be dropped gradually over a period of 12 to 17 years while a tariff wall is still maintained against exports from nations outside the plan. Even if the program never materializes 100 per cent, the effect even a partial realization will have on the export situation is obvious: The tariff restrictions on shipping into this Free Trade Area, combined with the labor cost differential between American and European industry, will make it all but impossible for American manufacturers to share in this mass market—unless the Americans actually own and operate plants within the area itself."

Listing reasons for the selection of Ilo-Werke, Mr. Rockwell said: "This company provides us with a going concern with a good sales outlook for its own products particularly in the export market. More important, it has the engineering and research strength and precision manufacturing know-how necessary to broaden the base of our research and development as applied to both American and foreign markets. In other words, through a two-way transfer of ideas and brainpower, we'll be able to cooperate in the development of products for both markets."

Ilo-Werke, Mr. Rockwell reported, has an engineering and research staff numbering approximately 260— many with doctors' degrees. "The manufacturing facilities," he added, "are modern and in good condition, and there is ample land available for expansion. This will enable us to build additional manufacturing facilities for the production of Rockwell products. We are already planning to erect a valve plant in the near future as a starter. In addition Ilo-Werke provides us with a complete management staff and established sources of supply—things we would have difficulty in acquiring by ourselves."

Most engines produced in Ilo-Werke's 185,000-sq ft Pinneburg plant are larger than those produced in the smaller plant at Munich—ranging from 100-cc piston displacement upward, while those at Munich are in sizes under 100-cc. Production at this plant has run as high as 8000 engines a month. Sales of the smaller engines produced at Munich are divided about equally between the motorcycle industry and general industrial applications. They are high-speed units with the principal parts die-cast and are produced here at a rate of about 600 a day.

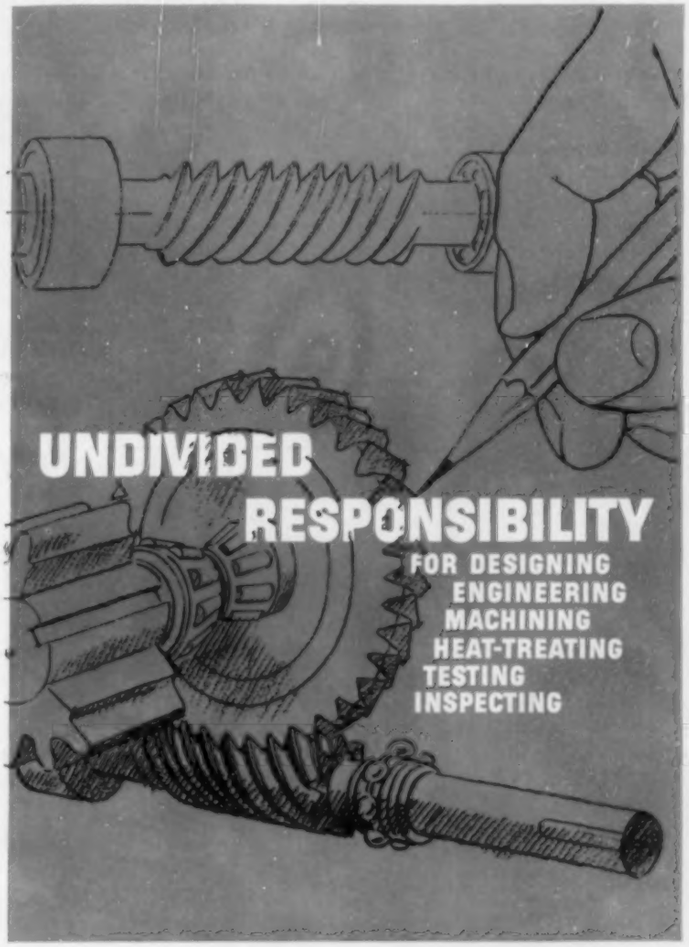
New England Distributor

The Snow-Nabstedt Gear Corporation of Hamden, Connecticut has announced the appointment of Hathaway Machinery Company in Fairhaven, Massachusetts, as its New England distributor, effective June 1st. Their territory will cover the area from the Connecticut-Rhode Island State line to the Canadian border. They will stock parts and maintain service for S-N gears. Hathaway Machinery Company is well known to most North Atlantic commercial fishing fleet owners, having served the industry for over thirty-eight years doing engine overhauling and all types of repair work.

The plant is located on Hathaway-Braley Wharf at Fairhaven, Massachusetts, with dockside facilities and receiving and shipping facilities for overland transportation. They will provide repair service through factory-trained personnel, and in order to give more complete service, they are appointing dealers in the major commercial fishing fleet centers in New England.

Assistant Sales Manager

The appointment of Francis E. Brylski as assistant to the General Sales Manager has been announced by Harold C. Clark, General Sales Manager, Diesel Equipment, of the Curtiss-Wright Corporation's Utica-Bend subsidiary. The Diesel Equipment division handles the sales of the Mercedes-Benz diesel engine line recently acquired by Curtiss-Wright. Mr. Brylski is a graduate of the University of Illinois and was previously associated with the Findlay Div. of Gar Wood Industries, Inc. as assistant to the vice president in charge of sales. In his new position he will assist in coordinating the sales and service activities on the entire Mercedes-Benz line of diesel engines ranging from 19 to 3000 hp.



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Mid-Continent Diesel News

By Jack Cozier

PARTON & Parton, Henrietta, Okla., purchased two Cat DW15 tractors and scrapers from McCormick Machinery Co., Tulsa, Okla., for watershed excavation.

KETTLE River REA, Kettle River, Minn., bought a Fairbanks, Morse 12 cylinder, 1920 hp, model 38DD8-⅛, dual fuel diesel engine.

REFINERY Engineering Co., Tulsa, Okla., has purchased a Marion model 35M crane with a 60 ft boom from Midwestern Engine & Equipment Co., Tulsa. The GMC diesel powered unit will be used on the job for Kerr-McGee Oil Industries at Wynnewood, Okla.

FLETCHER Transport, Pecos, Tex., has two Cummins truck engines with more than a million miles each behind them both in Autocar DC-75 tractors. Fletcher operates seven Autocar DC-75 tractors and one Mack L-J tractor all powered with Cummins diesel engines. Fletcher's trucks, with nine Fruehauf tank trailers, transport gasoline and butane between refiners and wholesalers within a 250 mi. radius of Pecos.

A. T. PERRY Pipeline Construction, Ottawa, Kan., purchased a model 140 Cleveland trencher. The unit powered with an International UD-350 diesel engine was sold by Leland Equipment Co., Tulsa, Okla.

WILKIE Construction Co., Claysville, Penn., bought a Cat MD7 tractor and pipelayer from McCormick Machinery Co., Tulsa, Okla., for pipe line work.

JOHN Gillian, Chandler, Okla., has purchased an Allis-Chalmers model HD 6B crawler tractor with bulldozer and ripper for miscellaneous oil field work. The sale was made by the Boardman Co., Tulsa, Okla.

BRUCE PAGE, Odessa, Tex., operates a Worthington model 315 rotary compressor powered by a Cummins NHC-BI-4 diesel engine in sand blasting and painting giant oil field storage tanks.

MIDWESTERN Constructors, Tulsa, Okla., has bought three Unit 1020A crawler tractors with back hoes and powered by GMC diesel engines. The tractors were sold by Midwestern Engine & Equipment Co., Tulsa, and will be used on pipe line work in Illinois.

VILLAGE of Caldwell, Ohio, purchased a Fairbanks, Morse eight cylinder, 1280 hp, model 38D8-⅛ diesel engine.

S. J. SLACK, Adabel, Okla., bought a Cat D8 tractor and bulldozer for land clearing work. The sale was made by McCormick Machinery Co., Tulsa, Okla.

PARTON & Parton, Henrietta, Okla., is utilizing an Allis-Chalmers model TS-260 motor scraper purchased from Boardman Co., Tulsa, Okla., for building earth dams for flood control.

REVELS Marine Towing Service, Inc., Morgan City, Louisiana, is operating the *J. H. Revels*, a twin-engine tug, powered by two Cummins NHM-600 marine diesel engines rated at 210 hp each. The builder was Walker Shipyards, Pascagoula, Miss. The reduction gear is a Capitol hydraulic gear with three to one ratio.

CITY of Mulvane, Kan., purchased a 12 cylinder, 1920 hp, model 38DD8-⅛ Fairbanks, Morse dual fuel diesel generating unit.

S. R. SMITH Construction Co., Tulsa, Okla., bought a Unit 1020A crawler tractor with a 40 ft crane boom for local storm sewer work. The GMC diesel powered tractor was sold by Midwestern Engine & Equipment Co., Tulsa.

EARL TAYLOR Construction Co., Tulsa, Okla., is operating a Unit 1020A crawler crane with back hoe and a 35 ft boom sold by Midwestern Engine & Equipment Co. Tulsa. This crane is powered by a GMC diesel engine and is being used on a city sewer job.

BURNEY Wehmier, Tulsa, Okla., has purchased a Cat D7 tractor and bulldozer from McCormick Machinery Co., Tulsa, for pipline work.

A & B INC., Odessa, Tex., is using seventeen model DC-75T Autocars powered by Cummins model HRFB diesel engines, rated at 180 hp each, for hauling sand and gravel in West Texas. The sales were made through West Texas White Truck Equipment Co., Inc., Odessa.

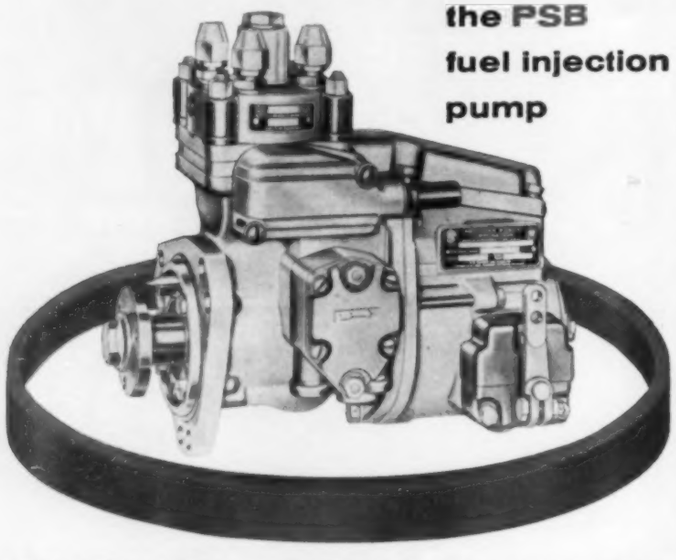
MARION Power Shovel Co., Marion, Ohio, has purchased two Fairbanks, Morse five cylinder 325 hp, model 31A 8½ diesel engines.

Engine Research With Radioactive Oil

Engine researchers can now know from minute to minute exactly what goes on inside the modern high compression engine. Evaluation tests that once took 100 hours running time are now reduced to a matter of a few minutes. A new application of radioactive materials in lube oil is providing an engine "basal-metabolism" for research engineers at The Cooper-Bessemer Corporation. As a result, development programs on new materials and designs are expected to be accelerated greatly to meet the demands for more and more horsepower, longer engine life and still better fuel economy than was previously possible, according to Ralph L. Boyer, Vice President and Director of Engineering.

In concentrated research programs involving the development of large engines, several runs of 100 hours are normally required to evaluate such factors as the effect of speed and temperature for example on lube oil consumption, Mr. Boyer points out. Very often the cost in terms of fuel and attendant manpower could limit the extent to which some research programs can go before research project budgets are overextended. An illustration of the benefits of Cooper-Bessemer's research with radioactive lube oil is the search into such important questions as at what point do piston rings actually seat. The answer, of course, is especially vital in pipeline compressor stations where engines are overhauled and re-ringed. In such cases, operators are inclined, through urgency, to put the engines on full load before the piston rings are seated. With new information obtained through Cooper-Bessemer's research with radioactive lube oil, manufacturers can recommend with reasonable certainty the earliest period when engines can be loaded fully without undue danger of scoring or without premature wear to rings and cylinder liners.

To develop their new research techniques, Cooper-Bessemer worked in conjunction with the Battelle Institute. The object of this combined effort was to determine what quantities of radioactive materials were required to provide adequate recordings. At the same time determination had to be made as to whether these additives would pollute the en-



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gine exhaust to the point of becoming hazardous. Basic standards of radioactivity in the lube oil set-up in these determinations now measure exactly how much lube oil is by-passing the piston rings by instrumenting the exhaust. From these readings it then becomes a simple matter to determine instantly what takes place within the cylinder walls as it happens. While there is much to be done in research techniques with radioactive materials, the projected advantages to development engineers are extremely promising. Basically, however, are the savings of time and costs in pursuing the development of new metals for pistons, rings and cylinder liners that will be needed in the future to withstand the higher and higher cylinder pressures of tomorrow's supercharged diesels, gas, and gas-diesel engines.

Waukesha Engineering Changes

A number of Waukesha Motor Company Engineering Department personnel have been assigned new positions and responsibilities, it was announced by Company management officials recently. Appointed to the post of Chief Engineer was J. R. Merriam, formerly Assistant Chief Engineer, who will assume the duties of Mr. Lloyd Bower, recently retired. Mr. A. W. Pope will serve as Chief Research Engineer. Mr. E. R. Rutenber, formerly Chief Installation Engineer, and Mr. H. M. Wiles, formerly Assistant Chief Research Engineer, were named to the two posts of Assistant Chief Engineers. Mr. J. P. Kelly, formerly Chief Draftsman, is the new Chief Design Engineer. As Chief Engineer, Mr. Merriam brings to his new position long experience with internal combustion engine design. He has been a member of the Waukesha Motor Company organization for over 35 years, starting in 1920 as a tool designer, and later transferring to the field of engine design. He has been concerned in the development of many of design features used in all modern internal combustion engines. He is an active member of various committees in the Society of Automotive Engineers and has also served on engineering development committees for other organizations, including the War Production Board.

Mr. Pope, Chief Research Engineer, has worked with the Company for more than 30 years. He is a graduate of the Massachusetts Institute of Technology and is internationally known for his contributions to the development of methods and standards for rating the performance characteristics of internal combustion engine fuels. He will continue his pursuits in this field and in addition will direct development work on new type diesel engines and gas turbine free-piston engines. He is a member of the Council of the Society of Automotive Engineers, an active member of SAE committees, and a member of other scientific organizations. Mr. Rutenber and Mr. Wiles each have approximately 30 years' service at Waukesha, Rutenber joining the organization in 1927, and Wiles in 1928. Both are licensed Wisconsin Professional Engineers. After nine years in the company's experimental laboratories, Mr. Rutenber, a graduate of Marquette University, was made an installation engineer and later, Chief Installation Engineer. Mr. Wiles started in development work on fuel rating engines. He is a graduate of Iowa State University. He was in charge of the experimental laboratories between 1936 and 1949, when he was appointed an installation engineer, and in 1956, Assistant Chief Research Engineer. In their new positions, Mr. Rutenber will be concerned chiefly with installation applications, and Mr. Wiles will direct the experimental laboratories. Mr. Kelly has been with the Motor Company for 11 years. A graduate of Purdue University where he majored in aeronautics and internal combustion engine design, he has been Chief Draftsman since 1955. In his capacity as Chief Design Engineer, he will be concerned with the Company's expanding engine development program.

Generators Delivered

American MARC Inc. has begun first deliveries of 454 static exciter 45 kw 400 cycle generators to prime contractor Stewart & Stevenson Services, Inc. of Houston, Texas. Designed and manufactured by American MARC's Electro-Dynamics Division, the generators are for use by the U. S. Army Corps of Engineers which will use them to power electronics equipment at missile launching sites and other ground operations.

The static exciter generators represent the first production of the Electro-Dynamics Division and are part of a $809,000 contract which also includes 117 conventional 20 kw generators for ultimate use by the U. S. Marine Corps. Production of the generators has been established at approximately 100 per month. The contract calls for completion of deliveries by April, 1958.

Aeroquip Appointment

The appointment of Mr. John C. Abbey as chief engineer of the Jackson engineering department has been announced by Aeroquip Corporation, Jackson, Michigan. The announcement was made by Mr. B. A. Main, Jr., vice president in charge of engineering. Mr. Abbey was formerly product engineer in charge of research and development of Self-Sealing Couplings. In his new assignment, he will direct all development engineering activities at Aeroquip's new engineering center at its Jackson, Michigan, headquarters. Mr. Abbey is a graduate of Albion College, Albion, Michigan, and took post-graduate work at Michigan State University and the University of Michigan. He is a lieutenant colonel in the United States Army Reserve, and served in Alaska and Italy during World War II.

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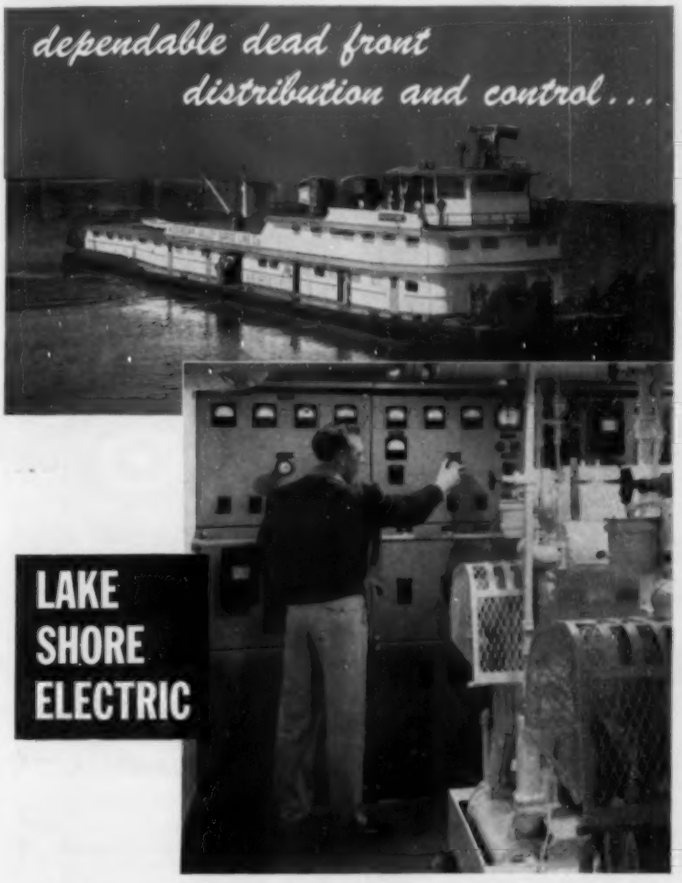

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Diesel Farm Notes

By F. Hal Higgins

LOWER costs of steel and labor are giving the British tractor industry an advantage over the U.S., says the *Financial Times* of London. International Harvester, Allis-Chalmers, Massey-Harris-Ferguson are well established there while Caterpillar's plant in Scotland will be in production next year.

THREE new diesel crawler tractors for the heavy industrial fields are to appear on the European market soon, says *Farm Mechanization*. Two will be powered by Rolls Royce diesels. These are the Vickers Vikon with a 4-cylinder 142 hp engine, and the other is the International TD 18 with a 6-cylinder 124 bhp engine. The other is the Cat D8 with its own 6-cylinder 191 bhp engine. Add the new Cat D4 to be stepped up to 63 hp from its old 40 hp and Britain will be producing a wider range of crawlers than ever before.

ITALY is all-diesel in its farm tractors above the smallest sizes and is following the U.S. trend to industrial uses of their farm tractors. Some of the new models offered this year are the OTO in 18, 25 and 45 models in both wheel and track styles; Motomeccanica has its PH350 crawler with front loader; Trattrici Glef is offered in 25, 35 and 50 with Deutz diesel engines; the 4-wheel drive *Tiger* ads show it equipped for the heavy dirt-moving jobs of ripping and bulldozing. The Lugli LD10 wheel type is offered as diesel for both agriculture and industry; and the revolutionary Carraro that has a model with grain drill mounted over the rear wheels, offers its CV18 with its new diesel. The Vender as Italy's big crawler diesel is offered with bulldozer, ripper and front loader as a challenge to the invading Cat and International lines handled by local Italian distributors. Each of these big U.S. manufacturers has three Italian distributors with several branches to cover the country.

A NEW diesel farm tractor that was featured in the August number of the *Italian Machine and Motori Agricol* is the La Super 202 of the Societa Francais Vierzon. It is rated at 27 hp. French, German, British and US diesels are all battling for the Italian as well as the other European areas. Ferguson, Massey-Harris, Ford, International, Caterpillar, Allis-Chalmers, are all found in the Italian statistics.

FARM PONDS as a hedge against drought in the mid-west farming areas have had a big increase in 1956, according to the conservation service. Over the past six years they have helped farmers build 425,521 ponds averaging from one to two acres in area. Last year, 87,430 farm ponds were built, an increase of over 1,000 over the previous high year. More live stock farming of lands taken out of crops and drought hedging were two factors in the increased use of farm tractors with bulldozers and front loader attachments. Those with the crawler diesels were in a position to do custom work at such jobs for increased use of their tractors to help pay their investments.

THE FRENCH Someca tractor recently passed the Nebraska Test in Test No. 625. It showed a sea level drawbar hp of 38.79. The engine is an O.M. Milano built in Italy. It is a 4-cylinder engine. Manufacturer is Someca 47, BD. Ornano, Saint-Denis, France.

BAKER-RAULING'S side-loading fork trucks are being powered by Hercules gas or diesel engines, as demanded by buyers. The DD-339 is 99 hp at 2,000 rpm. These trucks called Traveloaders are equipped with Allison torque converters. Primary and secondary fuel filters are Frams. Power steering and Wagner power brakes are features in this model.

THE J. I. Case Co. has announced it is doubling the customary six months service warranty on its counter-rotating hydraulic transmissions in the large Terratrac crawler tractors. The new one year warranty went into effect on all tractors delivered after July 15, 1957. Continental diesels drive these Case Terratracs.

IH Catalogs Announced

International Harvester Co. has announced availability of a new 12 page catalog covering its line of six diesel units. The booklet provides the inside story on the three 4-cyl units, the UD-281, UD-350, and UD-14A, which range in horsepower from 60 to 76, and on the more-powerful 6-cyl jobs, the UD-525, UD-18A, and the UD-1091, which embrace a wider range of power, from 115 to 200 hp. Diagrams, cross sections, exploded views, and photo close-ups illuminate the features of the units. Such desirable design features as the full-flow, by-pass cooling system in the UD-1091, the new open-face, single-orifice injection nozzle in all diesel units, and the new Lanchester engine balancer to provide extra-smooth operation in the 4-cyl engines are explained pictorially. One page is devoted to horsepower ratings and dimensions of the units. A power rating is provided, also, on the recently-introduced 250-hp turbotorque UDT-1091. One page, also, is reserved for showing the adaptability of all engines in the diesel line to any power requirement. This is done by a series of sequence illustrations depicting the UD-350 from a stripped power unit to one fully-dressed—with hood side-doors, subbase, etc. To obtain a copy of this catalog, request: Catalog CR-509-G, Construction Equipment Division, International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill.

The cycle-speeding advantages of International Harvester's line of off-highway haulers, the Models 95 and 65 Payhauler, are shown in a 16 page catalog just released. The colorful catalog is divided into four sections, describing Payhauler advantages on each phase of the haul cycle; spotting, loading, hauling and dumping. Close-ups of components that contribute to the advantages of the Payhauler on each phase of the cycle accompany each division of the booklet. For your copy of *Cycle-Speeding International (Models 65 and 95) Payhauler,*

Supercharger Intercooler and MONO-WELD® Engine Jacket Water Cooler by Young photographed prior to shipping to Venezuela.

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A Young Special Model 600 Engine Jacket Water Cooler and Young Supercharger Intercooler cools the White Superior 1765 hp Diesel Engine. The cooling equipment by Young is built to last the lifetime of the power plant which may be used in the future to supply the electric needs of a new Venezuelan town of 10,000 people.

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write for, Catalog CR603-G, Construction Equipment Division, International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill.

A new 16-page catalog, entitled *"Earth-moving Equipment, on tracks . . . on rubber,"* is now available from International Harvester Co., the company has announced. This bountifully-illustrated booklet covers virtually the entire IH mobile construction equipment line. The occupational range of this general catalog extends from mining to farming. Chockful of on-the-job photos, it shows among others, crawler tractors, Payscraper units, International Drott Skid-Shovels and 4-in-1 units, and Payhauler units. For a quick reference on what International has to offer in their earthmoving line and what owners have to say about International equipment, write for: Catalog CR-542-G, Construction Equipment Division, International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill.

Power Plant Purchase

A New Orleans diesel-power engineering firm today announced its successful bid to the Municipality of Houma, Louisiana, for nearly $2,000,000 worth of power equipment. W. J. Moran, district manager of the Gulf Coast Engine Division of the Nordberg Manufacturing Co., told officials of International Trade Mart, in which building he maintains offices, that he and other officials of his company were extremely gratified at the outcome of carefully researched plans on which the bid to Houma were based. "The City of Houma bought three 3750 kw units," Mr. Moran said. "To give you some idea of the size of the units, we believe that 25 railroad cars will be needed to move the equipment."

Mr. Moran referred to a recent story in the *Houma Courier* by staff reporter Alfred Delahaye as containing full and accurate information. The story reads in part: "By January of 1959, Houma will have the largest municipal diesel power plant in the State of Louisiana. Its capacity will be a total of 18,750 kw or between two and three times the present capacity of 7,500 kw. At a special meeting Wednesday night, the Houma City Council accepted a bid of $1,989,796.00 for the city's power plant engine needs. The bid was submitted by Nordberg of Milwaukee and was accepted by the council on the recommendation of Barnard & Burke, consulting engineers of Baton Rouge. Three two-cycle dual-fuel, 3,750 kw generating units, complete with Elliott generators and with an engine rotative speed of 257 will be furnished by Nordberg, the successful bidder. The first engine will be delivered within 155 days and will be in operation in 255 days, according to the terms of the bid. The second engine is due to be in operation in 390 days after the firm order; the third in 405 days. A remaining part of the city's power plant program will be modifications to the existing plant. This will cost approximately $950,000."

Cooper-Bessemer Branch Appointments

The establishment of a Branch Office in Toronto at 97 Eglinton Avenue East is announced by Charles G. Cooper, President of Cooper-Bessemer of Canada Limited. Mr. Les Moore, a graduate of the University of Toronto, will be in charge. Mr. Moore returns to Toronto after five years in sales and application engineering at the Cooper-Bessemer Corporation's Chicago office following two years engine and compressor engineering training at its main office. This background equips him to provide complete service to Canadian industries in the application and use of Cooper-Bessemer equipment, Mr. Cooper points out. This new office will supplement existing Cooper-Bessemer of Canada offices at Calgary, Edmonton and Halifax and warehouses at Edmonton and Halifax.

The promotion of Earl P. Martin to Assistant Branch Manager, Houston Office is announced by Grant C. Woodard, General Sales Manager of The Cooper-Bessemer Corporation. In his new position, Mr. Martin will work under the supervision of R. H. Dale, Branch Manager and will assist directly in the management of the Houston office and warehouse facilities. A graduate of the University of Kentucky in 1924, Mr. Martin was first associated with the Foxboro Company and the Rockwell Manufacturing Company before coming to Cooper-Bessemer in 1939. As a senior sales engineer for Cooper-Bessemer, Mr. Martin has since become widely known throughout the Houston area for his close, personal contacts with the oil and gas industry.

New Division Formed

Formation of Allis-Chalmers International as a major operating division of Allis-Chalmers Manufacturing Company, Milwaukee, Wis., is announced by R. S. Stevenson, president of the company. P. F. Bauer, until now general manager of the Industrial Equipment division, is appointed managing director of the new division. Floyd J. Mischke, who has been Tractor Group export manager, and Paul Dietz, who has been Industries Group export manager, are appointed associate directors of sales of Allis-Chalmers International. The new division will be responsible for all manufacturing, engineering and sales operations and activities outside of the United States and Canada. Manufacturing operations include plants in Essendine, England, which produces wheel tractors, harvesters and vibrating screens, and in New Castle, Australia, where motor graders are manufactured. Allis-Chalmers has sales offices and distributors throughout the world.

Service Tools

Bacharach Industrial Instrument Company has expanded its output of diesel shop equipment to include a wide line of fuel injection pump and governor service tools. These tools are essential and are factory-recommended for dismantling pumps and making necessary adjustments when checking pump calibration. With them, factory-recommended service operations can be performed for which ordinary shop tools cannot be used successfully. Typical of such operations are these on American Bosch PSB pumps: Installing and removing camshaft bushing, installing ball bearing in pump housing, removing delivery valve from pump housing, disassembly, assembly and timing of pump, pulling camshaft, testing opening pressure and pressure tightness of delivery valve. For tool recommendations applying to specific makes and types of diesel fuel injection pumps, write to the manufacturer. Illustrations and applications of currently-manufactured tools are given in Bacharach Bulletin 927. A copy of it can be obtained from Bacharach Industrial Instrument Company, 200 N. Braddock Avenue, Pittsburgh 8, Pa. (ITS NEW)

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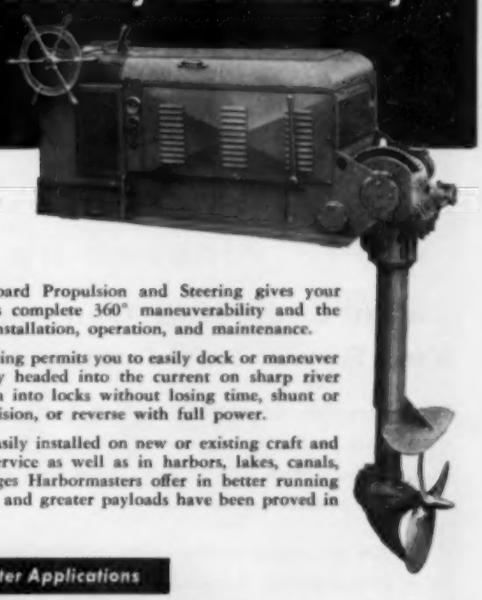

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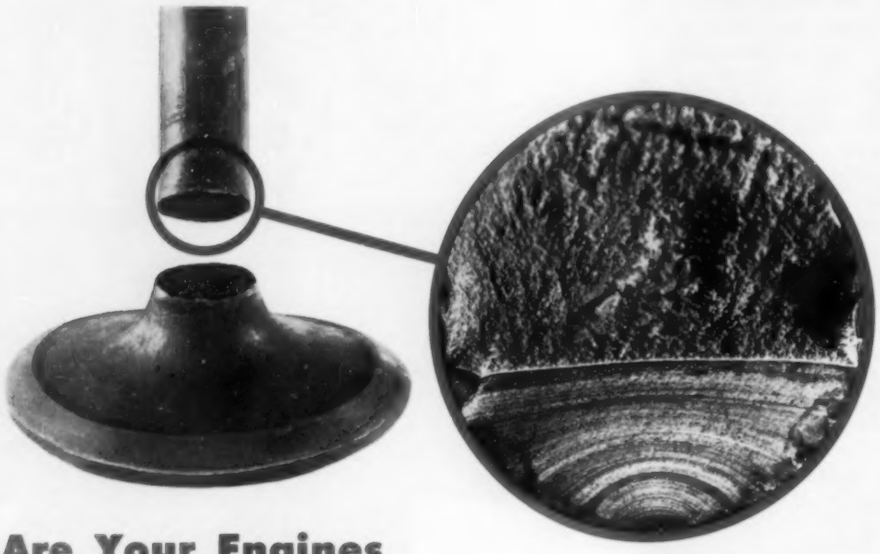
Willis Heads Waukesha Engineering

N. H. Willis

L. L. Bower

Newton H. Willis, recently named a vice-president of the Waukesha Motor Company, has been placed in charge of all the Company's engineering activities. He will continue to direct the Railway Division of the organization. As Vice-President of Engineering, he will be directly concerned in all phases of research, design, development work, and the application of the Motor Company's products for modern power requirements. Mr. Willis received a Bachelor of Science Degree in Mathematics and Physics from Carroll College in 1928. He also attended the University of Wisconsin College of Engineering where he was awarded a Bachelor of Science Degree in Mechanical Engineering in 1930. He started his career with the Waukesha Motor Company in 1930 as a design and engineering draftsman. In 1933 he began work in the Railway Division, then known as the Refrigeration Division, where he progressed to the post of General Manager in 1953. Mr. Willis is a licensed professional engineer. He is a member of the Tau Kappa Epsilon social fraternity; Tau Beta Pi and Pi Tau Sigma, honorary engineering fraternities; the Society of Automotive Engineers; and the American Society of Refrigeration Engineers.

Lloyd L. Bower, Chief Engineer of the Waukesha Motor Company since 1949, has retired from the Company effective September 1. In 1927 he began his career at the Waukesha Motor Company as Installation Engineer. In this capacity he coordinated engineering data and information for the sales department and for customers, gradually assuming more responsibility relative to coordinating engineering activities with the production, inspection, and service departments and working in the evaluation and application of laboratory test information. He also was in charge of engineering specifications. At the retirement of Mr. J. B. Fisher in 1949 Mr. Bower was named Chief Engineer of the Motor Company and has held that position until his retirement. Mr. Bower has held many positions of responsibility in various engineering organizations. He is a Registered Professional Engineer of the state of Wisconsin. He has been Chairman of the Engineering and Technical Committees of the Internal Combustion Engine Institute, a member of the Board of Directors of the Coordinating Research Committee, a member of the Technical Board (Reviewing Standards) of the Society of Automotive Engineers, which he joined in 1936, and was Chairman of the Milwaukee Section of that organization in 1946. He is also a member of the Army Ordnance Association and the American Legion.



Are Your Engines Plagued by Failures Like This?

Eaton Engineers Can Help You Solve This Problem

The photographs above illustrate a typical fatigue-type failure caused by overstressing, in which fracture starts at the surface and, with repeated high stress, progresses to final break.

If you are an engine manufacturer and are having valve gear problems, Eaton engineers will be glad to consult with you and recommend procedures to help solve them. Or if you are designing new engines, perhaps our past valve experience can be valuable to you. Write, wire, or phone — there's no obligation.

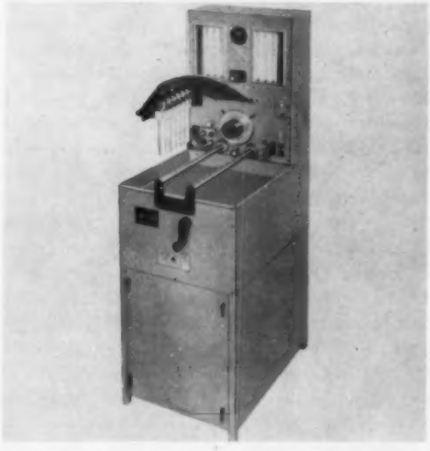
Eaton Technical Reports are Available to Manufacturers

Eaton valve engineers will be glad to make a thorough study for you and furnish a complete technical report.

EATON *VALVE DIVISION*
MANUFACTURING COMPANY
9771 FRENCH ROAD • DETROIT 13, MICHIGAN

PRODUCTS: Engine Valves• Tappets• Hydraulic Valve Lifters• Valve Seat Inserts• Jet Engine Parts• Hydraulic Pumps Motor Truck Axles• Permanent Mold Gray Iron Castings• Forgings• Heater-Defroster Units• Automotive Air Conditioners Fastening Devices• Cold Drawn Steel• Stampings• Gears• Leaf and Coil Springs• Dynamatic Drives, Brakes, Dynamometers

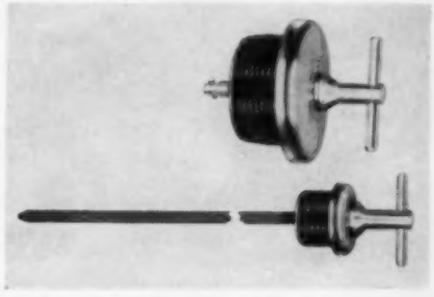
Calibrating Stand For Fuel Pumps



Bacharach Industrial Instrument Company has added to its line of fuel injection service shop equipment the SP-600 Calibrating Stand for fuel injection pumps used on diesel-powered transportation, construction, and farm equipment. This stand, with accessories, has been designed for calibrating diesel fuel pumps and setting governors in accordance with factory-recommended testing procedures. It is particularly suitable for shops servicing American Bosch PSB and APE-A Pumps, John Deere Pumps, International Harvester Pumps and other similar types of fuel injection pumps used in the smaller diesels which represent the major portion of today's diesel engine population. Accessories are offered in many different sets to suit requirements. Features of the SP-600 Fuel Pump Calibrat-

ing Stand include: 1 horsepower, 110/220 volt, single phase, 60 cycle AC motor; variable speed transmission featuring step-less speed adjustment controlled from front of stand—forward or reverse rotation; speed range 150-2600 rpm; fuel accumulator rack may be positioned at either side of stand to facilitate servicing of right or left-hand pumps; automatic stroke counter for 500 pump strokes. For complete particulars request Leaflet 918B from Bacharach Industrial Instrument Co., 200 N. Braddock Ave., Pittsburgh 8, Pa. (ITS NEW)

Seals For Pressurized Diesels



Positive seals against dirt and engine-damaging impurities have been developed by the Moeller Manufacturing Company, Racine, Wisconsin, for dipstick openings and oil ports. Diesel engines with low pressurized crankcases are using Moeller adjustable closures for air-tight protection. Turning the closure handle expands the rubber washer to seal the opening. Turning in reverse loosens the seal for removal of the dipstick or oil filler plug. Moeller air-tight seals are important achievements in the fight against dirt in diesel engines. Their adjustability, their rust and corrosion-resistance, and their positive sealing action make them especially suitable for the pressurized systems of diesel dirtproofing. (ITS NEW)

Flexible Cushion Coupling

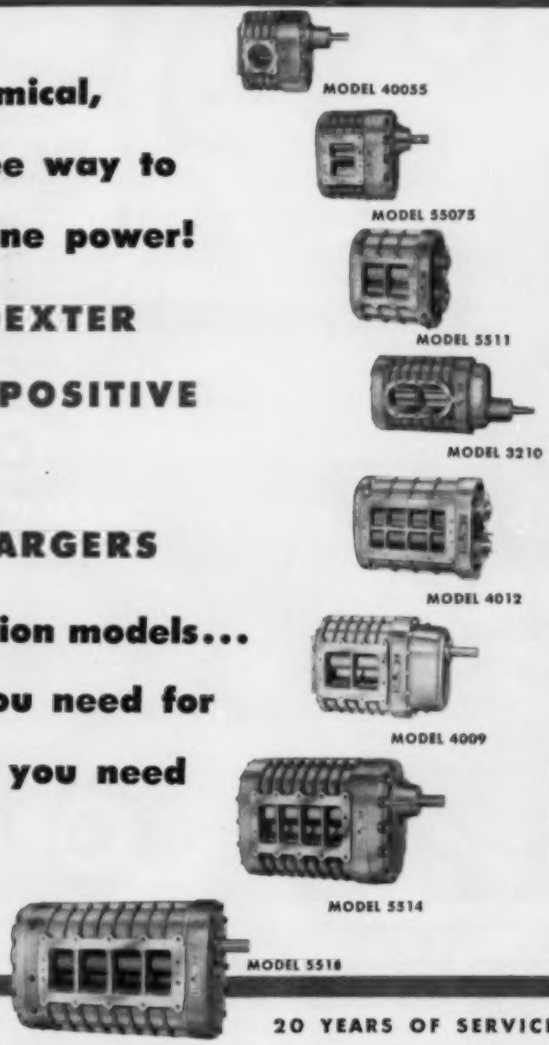
For use wherever mechanical power is to be transmitted, the new wood Sure-Flex flexible coupling has only three basic parts: two hub flanges and a two-piece rubber sleeve. The internal and external teeth of the flexible sleeve mate with the flange hub teeth and lock tight under torque load without clamps or screws. The elastic rubber sleeve with two planes of engagement absorbs both angular and parallel misalignment. There are no rubbing or wearing surfaces and hence no need for lubrication. All shock vibrations are absorbed and prevented from being transmitted by the coupling sleeve. This high torsional flexibility of approximately 15 degrees at peak torque provides smooth power transmission. Sure-Flex couplings are designed to tolerate, without wear, internal abuse or high resisting forces, angular misalignment of up to one degree, parallel misalignment of from $\frac{1}{32}$ to $\frac{1}{16}$ in., depending on shaft size, and free end-float up to $\frac{1}{16}$ in., depending on size. Angular or parallel misalignment does not generate unbalance or pulsations since all flexing takes place within the rubber sleeve member. Shafts and bearings last longer because no destructive overhung loads are imposed at any load through misalignment.

T. B. Wood engineers report that final assembly of the coupling can be made without tools of any kind. Shaft alignment is checked from the precision-machined flanges. Halves of the split rubber sleeve slip axially into place. A retaining ring may be added to hold the split sleeve for high-speed operation. Declutching is as easy as assembly. Simply slide one hub flange along its shaft until the sleeve can be slipped out of the hub flanges. Shaft alignment does not need to be disturbed. There are no bolts to untighten, no covers, gaskets nor seals to remove. The coupling reportedly is unaffected by abrasives, dust, dirt or moisture. There is no need to worry about the life of seals, guards or dust stops because none of these are used. Sure-Flex couplings are presently supplied in six sizes for motors from 3 to 80 hp. Shaft bores are available from $\frac{5}{8}$ to $2\frac{1}{4}$ in. Write T. B. Wood's Sons Co., Chambersburg, Pa. for more information. (ITS NEW)

The economical, trouble-free way to boost engine power!

MIEHLE-DEXTER ROTARY POSITIVE 3-LOBE SUPERCHARGERS

12 production models... the unit you need for the power you need



PROVED IN OVER 20 YEARS OF SERVICE

md Miehle Dexter

SUPERCHARGERS
TURBOCHARGERS
INDUSTRIAL BLOWERS

PLUS... The Revolutionary New m-d TURBOCHARGER

Exclusive Miehle-Dexter monorotor design boosts fuel efficiency, develops high pressure ratios up to 3 to 1.

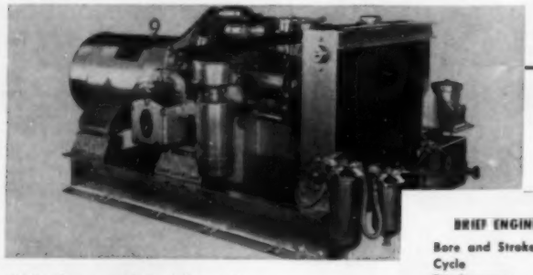
Miehle-Dexter Supercharger Division, Racine, Wisconsin • Telephone MElrose 4-5521 • Another Product of Miehle-Goss-Dexter, Inc.

WITTE MODEL 100RDA

A Diesel Engine-Generator Unit
12KW (Continuous)—1800 RPM

This powerful, compact, diesel engine-generator unit is setting outstanding performance records in maintaining either low (–10°F) or high (70°F) temperature in 50' mechanically refrigerated railway cars.

Many other uses are being found for the Witte 100 Engine, which powers this unit. Its low profile (30") makes it desirable in either stationary or mobile applications. Its two horizontally opposed cylinders provide an unusually smooth, vibration-free unit. The 100 Engine is built for continuous 24-hour-a-day operation and is outstanding in heavy-duty industrial applications.



BRIEF ENGINE SPECIFICATIONS

Bore and Stroke	4" x 4"
Cycle	4
Displacement	100 cu. in.
Speed	1,800 rpm
Horsepower: Continuous	18 hp
Maximum (Bare Engine)	23.7 hp
Height	30"
Width	39"
Length (Approx.)	66"

Write for complete information . . .

WITTE ENGINE WORKS

OIL WELL SUPPLY DIVISION
UNITED STATES STEEL CORPORATION
1606 Oakland Ave.—Kansas City 26, Mo.

UNITED STATES STEEL

Save Time with MARMAN Joints

Flexmaster Pipe Coupling for hot water and lube oil systems on locomotive and stationary diesel engines. Features: quick assembly with no pipe cutting or threading; absorbs vibration and shock; allows minor misalignment. In sizes for 2½" and 3" pipe.

Servicemaster V-Band Tube Joint for automotive, truck and stationary engine exhaust systems. Features: quick installation and disassembly for servicing; eliminates bolted flanges on tubing. Available in corrosion-resistant or mild steel for O.D. tube sizes from 1½" to 4½".

MARMAN DIVISION
Aeroquip Corporation

INDUSTRIAL SALES DIVISION
11214 EXPOSITION BLVD., LOS ANGELES, CALIFORNIA
IN CANADA: AEROQUIP (CANADA) LTD., TORONTO 10, ONT.
Marman Products are Covered by U.S. and Foreign Patents and Other Patents Pending

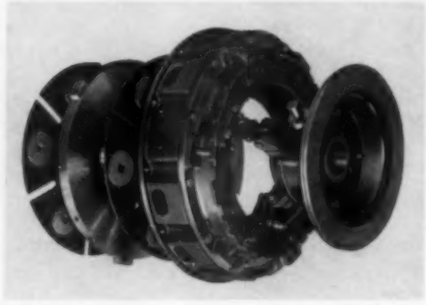
Please send full information on Marman
☐ Flexmaster Pipe Coupling
☐ Servicemaster V-Band Tube Joint
For pipe and tubing connections

Name
Title
Company
Address
City Zone State

Flexmaster and Servicemaster are Aeroquip Trademarks

Clutch and Power Take-Off Developments

A double-plate Rockford clutch (Utilizing two Morlife Plates—equipped with button type facings) provides 100% more torque than single-plate clutches equipped with Morlife plates—and up to 200% more torque than single-plate clutches with organic faced plates of the same diameter, 400% more service life—without adjustment or plate replacement— and 50% more heat resistance are other features of this heavy-duty Rockford clutch



reported by Rockford Clutch Engineers. A brake plate is mounted on the heavy-duty ball bearing type release sleeve. Used in large crawler type tractors and other heavy-duty machines, this double-plate Rockford clutch provides added torque with less clutch size. Rockford Clutch Division of Borg-Warner Corporation at Rockford, Illinois has available a variety of test reports covering this clutch that are of interest to designers of heavy-duty equipment.

Designed to meet the long-life, extra heavy-duty needs of Oil Field and other rugged service a new Rockford Power Take-Off has several new features.

The conventional and oft-times troublesome power take-off pilot bearing has been eliminated. Outboard bearing supports and flexible couplings may even be found unnecessary because of the heavy-duty construction, including the arrangement of main bearings. The Main Shaft Bearings do not require lubrication more often than once a year. The Clutch Release Bearing is lubricated for life. The main bearings are of the 40,000 hour type. Belt loads up to 5,000 lbs are handled on the well supported drive shaft. Manufactured by the Rockford Clutch Division of Borg-Warner Corporation, this extra heavy-duty Power Take-Off is furnished with single or double plate, organic or Morlife cerametalic faced gear-tooth drive type clutches.

ITS NEW

Diesels in the Northwest

By F. Hal Higgins

Diesels found at work on highways in British Columbia on my recent trek into the Northwest late in July and early August are more varied as to make than in the U.S. west coast states. There are English, German, Canadian and U.S. diesels, according to distributors, manufacturer branches and contractors. Vancouver is in as hectic a boom with increasing population and as high real estate values as can be found on the West Coast. E. W. Hall, Statistics Engineer for the Dept. of Highways of British Columbia lists their big bridge program in this Vancouver area as the outstanding projects in this province. Under construction now are Second Narrows Bridge, as a link in the Trans-Canada highway; the Agassiz-Rosedale bridge crossing the Fraser river at Agassiz; and the Middle Arm and Oak Street bridges have just been completed. The Deas Island tunnel across Fraser river from Lulu Island to Sea Island for the Vancouver airport have just been completed. International, Allis-Chalmers, Wagner, GM Euclid, LeTourneau Westinghouse diesel powered equipment were giving colorful action to the "bridge game" being played here in Vancouver.

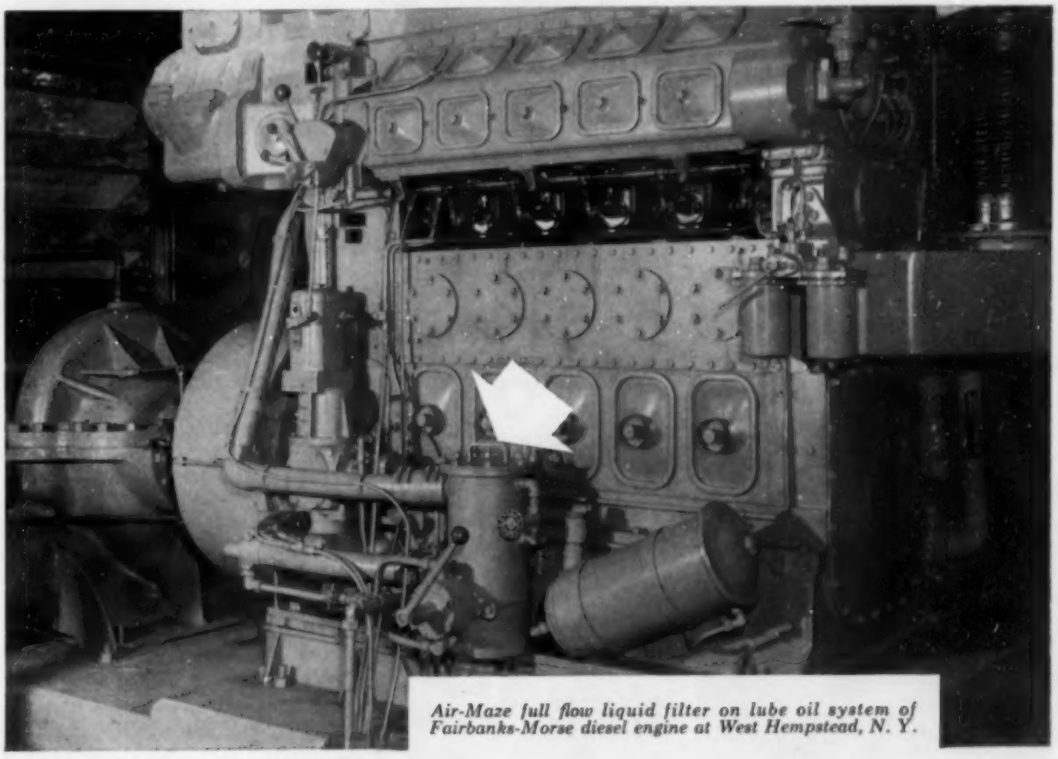
Howard-Cooper Corp., with forty years in the heavy equipment field as distributors, have some International scrapers out on the big freeway east of Seattle. Three Cummins-powered Internationals were going great on moving dirt a half mile from one side of the big freeway to the other through an underpass. Two of their scrapers were 55s and the other a 75. Working with the three Internationals on this job was one Euclid with GM engine.

Manager Wickwire of the J. I. Case Co. branch house in Portland says he can't get enough Terratracs in Continental diesel models to supply the demand in his territory. These are largely the 800 and 1,000 size models and all in industrial work.

Maintenance Manual

A new maintenance manual on Kim Hotstart electric pre-heaters for gasoline and diesel engines has just been released by the manufacturer. The 12 page manual deals with the regular inspection and servicing of Kim units and outlines a program of preventive maintenance that insures greater efficiency and longer life on installations. Contained in the pocket size booklet are models and sizes, parts lists for standard and special units, exploded drawings of the various models and informative material on replacement of elements. Kim pre-heaters are used in the transportation, trucking and construction industries. The device is a motor warmer, particularly effective in cold weather in effecting economies in warm-up time, reducing engine wear and maintenance and eliminating the need for winter terminal storage. The unit plugs into any ac or dc electric outlet. It draws cold water from the engine and into the heater. Water is forced through the heater by a percolator-like action, from which it flows back into the engine. Copies of the maintenance manual may be obtained by writing the Kim Hotstart Mfg. Co., West 917 Broadway, Spokane 1, Washington.

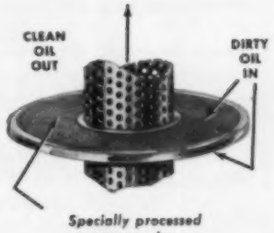
NOW AVAILABLE! The Brand New **DIESEL ENGINE CATALOG,** Volume 22. This giant, 400 page, 10½" x 13½", fully illustrated reference book containing complete and detailed engine and accessory sections is the biggest and best yet. Mail orders are now being filled for this "Bible of the Industry," which has been revised, rewritten and brought up to date completely from cover to cover. Send your order in now for this limited edition, which costs $10 postpaid plus California sales tax where applicable. Send checks or company orders to **DIESEL PROGRESS,** 816 N. La Cienega Blvd., Los Angeles 46, Calif.



Air-Maze full flow liquid filter on lube oil system of Fairbanks-Morse diesel engine at West Hempstead, N. Y.

Bearing life doubled

with AIR-MAZE liquid filters



Dirty oil passes through opposite sides of multiple filter discs, depositing dirt on face of screen. Clean oil is delivered through perforated tube to discharge port.

Air-Maze full flow oil filters, in combination with by-pass filters, often double the life of main bearings on diesel engines. That's because all of the oil is filtered all of the time. Wear-producing particles are stopped *before* the lube oil reaches the bearings.

The cost of an Air-Maze full flow filter is less than the expense of replacing one main bearing.

Made of specially processed screen cloth in an extended area design, Air-Maze liquid filters are easy to clean, need no replacements. Available in capacities up to 720 gpm, they may be had with or without relief valves, for both high and low pressure systems, and in various degrees of particle separation.

Write for full details in Catalog LFC-556. Air-Maze Corporation, Cleveland 28, Ohio. Dept. DR-11.

AFI MEMBER AIR FILTER INSTITUTE

The biggest names in diesels are protected by AIR-MAZE

AIR FILTERS
SILENCERS
SPARK ARRESTERS

AIR-MAZE
The Filter Engineers

LIQUID FILTERS
OIL SEPARATORS
GREASE FILTERS

West Coast News

By James Joseph

FOR THEIR roll-crusher operating Mt. Hood area, Portland's Parker Schramm Construction Co. has purchased an Allis Chalmers 8DAS-1125 power unit turning 1800 rpm, developing 242 hp.

OPENED at 7010 Broadway (Lemon Grove) San Diego, E-W Equipment Co.'s new Cummins sales-service depot. Owner is Earl Winters.

TO AMERICAN Independent Oil Co., San Francisco, two 6-cylinder, model 49B4½, 180 hp Fairbanks-Morse engines.

CALIFORNIA Compress Co., Fresno, has purchased a Fairbanks-Morse model 49, 150 hp diesel, to drive deep well turbine fire pump.

INSTALLED in the purse seiner *Newport* owned by Seattle's Martin Suich, a GM 6-110 series diesel, replacing heavier duty engine.

REPLACING gasoline engine in the U.S. Fish & Wildlife Service's patrol boat *Harlequin*, operating in Petersburg, Alaska area, two 4-51 series, GM diesel marine engines.

TO FIORITO Bros, Seattle, three GM Detroit series 6-110 diesels rated 300 hp at 2000 rpm to power three Euclid S-18 scrapers, 18-yd capacity. Sale by Seattle's Evans Engine & Equipment Co., Inc.

POWERING a Baldwin-Lima-Hamilton 25 ton log loader is a GM series 4-71 diesel rated 143 hp at 2100 rpm. Sale to Henry C. Morley, Hoquiam, Wash.

ON STANDBY duty at LA County's new central heating-refrigeration plant is a GM 6-71 generator set.

TO FAIRBANKS, Alaska's Burgess Construction Co., Inc., a GM 4-71 series diesel rated 134 hp at 2000 rpm to power a Michigan 2¾-yd tractor shovel.

BINGEN, Washington's Hollenbeck Lumber Co. has installed a 13 AKP Torcon torque converter in their ¾-yd log loading Lorain MC-524. Installation features a Young heat exchanger. Sale by Hamilton Engine Sales, Inc., Portland.

THREE GM 6-110 marine diesels are powering three new draggers and purse seiners, the *Yankee*, *Yankee Boy* and *Yankee Girl*, owned respectively by the Glenovich brothers, Paul, Bob and John. Installation by Bellingham Marine, Inc., Bellingham, Wash.

TO CHRIS Berg, Inc., Fairbanks, Alaska, a series 4-71 GM Detroit diesel powering a Lima model 44 crane.

FOR SAN Francisco's American Independent Oil Co., a Fairbanks-Morse 6-cylinder model 49B4½, 180 hp diesel engine. This the third delivered to the company in recent months.

TO KETCHIKAN Pulp Co., Ketchikan, Alaska, a GM 6-71 diesel for their Euclid model 84FD rear dump truck.

FOR EVERETT, Washington's Pacific Towboat Co., a GM marine 6-110 series diesel, for tugboat nearing completion.

TO BANCO Nacional de Credito Agricola, S.A., Sonora, Mexico, a Fairbanks-Morse 5 cylinder, 375 hp model 38F5¼ diesel engine.

CHIHUAHUA, Mexico's Bosques de Chihuahua has taken delivery on a 640 hp Fairbanks-Morse diesel.

FOR THE Nathan L. Fairbairn Agency, Inc.'s yacht *Wololi*, a Fairbanks-Morse 4 cylinder, 21 hp diesel.

Introduces Fire Extinguisher

A new home-type fire extinguisher in the handy 12 ounce pressurized can has been announced by Spray Products Corporation, Camden, N. J. Called Spray Fire Extinguisher, the new product is effective against virtually all types of first-stage fires. It is non-poisonous and contains no carbon tetrachloride. Now being marketed throughout the entire Spray dealer organization in the United States and Canada, the new fire fighter was years in development, according to Miles Powell, Vice-President in charge of sales. "The threat of fire, along with the tremendous loss in life and property and the often hideous consequences, is ever present with all of us," said Mr. Powell. "The average home has no real fire protection whatever. If even the smallest fire were to start, most people would be absolutely helpless. Spray Fire Extinguisher provides protection for those crucial first seconds after small fires start. It will extinguish virtually any type of first-stage fire, from which most large fires start. It's as handy and easy to use as a perfume atomizer, and just as safe in the home. It's so inexpensive that a can of Spray can be kept wherever fires are apt to start, in the home, particularly in the kitchen, basement, attic, workshop, garage, in the car, truck or boat, and in one's place of business," Mr. Powell said. The retail price of a 12 ounce can of Spray has been set at $1.95, add duty and tax in Canada. Spray Products Corporation, is best known for its Spray Starting Fluid, a highly combustible priming fluid that causes gasoline and diesel fuel to ignite in seconds under conditions of extreme cold or dampness. (ITS NEW)

Controls Plant

Formal opening of The Garrett Corporation's new AiResearch pneumatic controls building took place recently in Phoenix, Arizona as the plant began full production. The newly completed building houses 40,000 sq ft of work area on an eight acre tract with office space occupying 24,000 ft and 16,000 ft for assembly. The entire building is refrigerated. Close to 500 employees are at work in the new center designing, producing and testing precision controls for air, liquids and gases for commercial and military aircraft as well as missiles and rockets. The concrete block structure houses engineering, drafting, sales, purchasing, manufacturing controls and personnel offices as well as production and testing departments; all dealing with the valve industry. Raymond Jensen, AiResearch assistant chief engineer, who heads the new facility says that increased business in the valve field made the expansion necessary and a master plan calls for an additional 80,000 sq ft in the future.

Filter Catalog

Porous Sintered Stainless Steel Filters are described and illustrated in a new Cuno Engineering Corporation catalog. The 12-page catalog provides characteristics, application data and specifications on Cuno's complete line of this unique filter medium. A selector chart with instructions, plus filtration data tables are added features that help in filter selection. Designed for high temperature (1,000 °F+ for standard material) high differential pressures and filtering corrosive fluids, Poro-klean filters are preformed and fabricated into a multitude of sizes and configurations. Write or call The Cuno Engineering Corporation, Meriden, Connecticut, and ask for catalog 54-101.

Why are bus operators enthusiastic about . . .

ROOSA MASTER

"We started to convert our fleet of buses from gasoline engines to diesels in January 1955. Now we have 62 ACF Model C-36 city type buses with Fageol-Leyland diesel engines equipped with ROOSA MASTER fuel injection pumps.

"Prior to conversion, our fleet fuel average was 4.03 miles per gallon. Today, our average miles per gallon is 7.4, or about an 84% saving in fuel consumption.

"Many of our buses have traveled over 100,000 miles and some still have the original ROOSA MASTER fuel pumps."

This is a fine tribute from Southern Pennsylvania Bus Company of Chester, Pa., another satisfied user of ROOSA MASTER, the lighter, smaller, more economical fuel injection pump that makes good diesels better. For more complete information contact your engine manufacturer or write . . .

HMS ROOSA MASTER

HARTFORD MACHINE SCREW COMPANY
DIVISION OF STANDARD SCREW COMPANY
HARTFORD 2, CONNECTICUT

Napier Incorporates

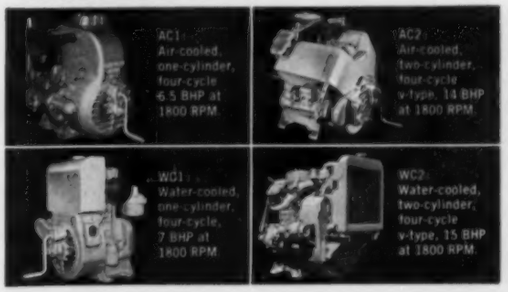
D. Napier & Son Limited, London, has formed a new Corporation—Napier Engines Incorporated, with Headquarters at 909 Dupont Circle Building, Washington 6, D.C. Napier interests in the U.S.A. have previously been handled by Technical Representatives. Mr. L. O. Brooks, Napier Diesel and Turbo representative, now becomes an Officer of the new Corporation and Manager of the Industrial and Marine Division. The principal objective of the U.S. Subsidiary is to market Napier products which comprise Gas Turbines, Turbochargers and the Deltic Diesel; also to provide parts and service together with overhaul facilities.

New Scraper

Lowbowl scraper design has now been made available for use with the Caterpillar D7 Tractor. Announcement of the No. 435 Lowbowl Scraper has been made by Caterpillar Tractor Co. The new, four-wheel scraper, which replaces the Caterpillar No. 70 Scraper in the company's line, incorporates many operational and dimensional features which result in higher production and a resultant lower cost per yard of earth moved. As with the other Caterpillar Lowbowl Scrapers, the low silhouette of the No. 435 allows material to enter the scraper with a minimum of lifting effort and material-to-material friction. On a comparative basis, the No. 435 Scraper offers 38.6 sq ft of bottom area to 31.9 sq ft for the No. 70, an increase of 6.7 sq ft for the new scraper. This increase helps to provide the new unit with a struck capacity of 13 cu yds, an increase of 27% over its predecessor model. Because of its additional width, the No. 435 Scraper provides a broader base for heap loading, and can transport 18 cu yds of heaped material. Due to the benefits of Lowbowl design, the No. 435 is capable of these greater capacities though the height of its sides is 2 in. lower than those of the No. 70 Scraper. Further, to assure thorough, positive ejection, the No. 435 is designed with an ejector of increased height, and greater apron opening. Protection against fouling of the draft arms due to rock spillage over the scraper sides is afforded by the incorporation of rock guards as standard on the new unit. Another feature attributed to the low silhouette of the No. 435 Scraper is greater stability, due to the lowering of the loaded units center of gravity. Additionally, the wider base of the scraper increases the width of cut to 9 ft 4 in. from the previous model's 8 ft 6 in. From the standpoint of versatility, the No. 435 is large enough to be economically used with the Caterpillar D8 Tractor as well as also being available for use with the D6 Tractor. (ITS NEW)

THE BIG 4 IN DIESEL POWER

AMERICAN MARC Inc. dominates the field of lightweight, low-horsepower Diesels by building its diversified line from the "Big Four" basic models illustrated here. Purchase and maintenance of engines and parts are simplified by the use of these compact and rugged prime movers.



AC1: Air-cooled, one-cylinder, four-cycle 6.5 BHP at 1800 RPM.

AC2: Air-cooled, two-cylinder, four-cycle v-type, 14 BHP at 1800 RPM.

WC1: Water-cooled, one-cylinder, four-cycle, 7 BHP at 1800 RPM.

WC2: Water-cooled, two-cylinder, four-cycle v-type, 15 BHP at 1800 RPM.

AMERICAN MARC also manufactures Diesel generating plants from 3 to 10 KW (AC or DC, and industrial three-phase), Diesel pumping units from 48 to 1700 GPM, marine propulsion, refrigeration units and power-packages for other services. American MARC can adapt any of its Big 4 engines to fit every job requiring from 5 to 20 BHP.

INQUIRIES ARE INVITED FROM DISTRIBUTORS AND DEALERS

AMERICAN MARC INC.
DIESEL ENGINES
1601 West Florence Ave. Telephone OR 8-7174
Dept. D-117 Inglewood, Calif.
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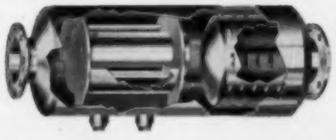

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Crewboat *Boo Boo VII*

The old adage that beauty and practicality can go hand in hand has been proved once again—this time in the field of crewboat design. A case in point is the *Boo Boo VII*, recently powered by George Engine Company, Inc. of Harvey, La. and built by Scariano. To look at her you'd say she was a yacht, because the lines are sleek and pleasing to the eye. But for performance, she's all crewboat with a matched pair of GM diesel engines to give her top speed and high dependability. From any angle a beauty, the *Boo Boo VII* is the latest addition to the fleet owned by Jeff Wickes of New Orleans. Mr. Wickes has been in the boat rental business for 6 years, and presently owns the *Boo Boo II, IV, V* and *VI*. Statistics on the *Boo Boo VII* include the fact that she's a 42 ft crewboat built for rugged performance, twin screw, incorporating the latest passenger accommodations. When the time came to install her propulsion power, a pair of matched GM diesel engines were selected—Models 6071A and 6072A. This gives the *Boo Boo VII* a top speed of 29 mph.

New Motor-Generator Set

A small light weight motor-generator set to convert direct current to alternating current has been developed by Kato Engineering Co., Mankato, Minnesota. The machine not only meets high performance standards but is designed for many continuous hours of trouble free operation. Both motor and alternator are incased within a common frame with single shaft, two ball bearing construction, thus eliminating a coupling and creating a compact, space saving, light weight unit.

The unit frame and side straddle mount panel are newly designed by Kato mechanical engineers to create an extremely attractive machine with smooth lines. The all welded structural steel frame is encased with 26-gauge stamped sheet steel. The machine operates at 1800 rpm. Generator ac output is 120 volt, 1 phase, 60 cycle, 2500 watts. dc motor is minimum voltage 27½ volts and maximum 29 volts. A Lee governor controls the motor revolutions per minute. Instrument panel includes frequency meter, ac volt meter and input voltage control rheostat. Lead wire taps can be seen at the lower corners of the panel. The machine is 28 in. long and 17 in. high. It weighs 550 pounds.

Motor-generator sets in similar frames are made to change ac frequencies in sizes from 400 watts to 400 kw and in various sizes to change direct current to many fixed and variable frequencies from 25 to 1200 cycles. (ITS NEW)

Snow-Nabstedt President

T. S. Nabstedt

Tracy S. Nabstedt was recently elected President of The Snow-Nabstedt Gear Corporation of Hamden, Connecticut, manufacturers of the well-known Joes and S-N marine reverse and reduction gears. Tracy S. Nabstedt came with the Company in 1941 working mainly in sales and service and has remained with the Company since that time except for four years during which he served in the U.S. Navy. During his service in the South Pacific he was in charge of maintenance of PT boat transmissions which were designed and manufactured by the Company. He returned to the Company in 1946 and has been successively active in Methods, Service and Production. In 1952 he was made Vice-President, and in 1955 General Manager. Tracy S. Nabstedt succeeds his father, Arthur T. Nabstedt, Sr., who joined the firm in 1916 as general manager. At that time the business was manufacturing various products including marine reversing gears. The Company was known until 1942 as Snow & Petrelli Manufacturing Company.

Through his efforts and his invention of the famous Joes husky gears the firm grew. In 1942 the firm was renamed The Snow-Nabstedt Gear Corporation and built a modern plant in Hamden. At the retirement of Mr. Snow in 1946, Mr. Nabstedt was named President. Mr. Nabstedt continues as Chairman of the Board. Snow-Nabstedt's new President attended Phillipps Exeter Academy and Yale University. He is a member of the Society of Naval Architects and Marine Engineers, American Society of Naval Engineers and the Naval Gear Industry Committee.

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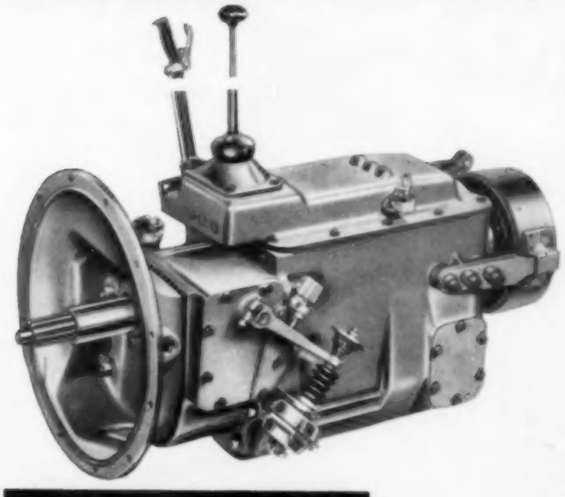

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